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Human Anatomy

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Preface

The first edition of this atlas which appeared in 1963/64 in German, English, Italian and Japanese was received with great enthusiasm because of its high quality from scientific and technical viewpoints.

With a view toward the needs of the surgical specialties this edition represents a continuing effort to complement the illustrative material from the original drawings by Pernkopf and his collaborating artists with new color plates as well as new roentgenograms which reflect new techniques and requirements in modern medicine. To this end, Dr. Lothar Wicke of Vienna has supplied most of the roentgenograms. The formulation of new short and precise captions was an important prerequisite for translation into other languages. From a technical viewpoint, the editor and publisher have gone to the trouble of making further improvements, such as significantly decreasing

the number of reference lines on the color plates in order to improve "readability," reproducing two-page drawings, which were severely impaired by the center crease, in a reduced single-page format, and reorienting the horizontally wide plates so as to conform to the vertical configuration of the page wherever this was possible without impairment of quality, etc.

The nomenclature used is based on *Nomina Anatomica* (Oxford, Paris, New York, Wiesbaden) with a few exceptions where the term did not seem acceptable to the editor (e.g. Esophagus instead of Oesophagus). For anatomical structures not listed in the *Nomina* the Latin names used by Pernkopf were employed.

Fall 1979

Helmut Ferner

The Head

The Skull

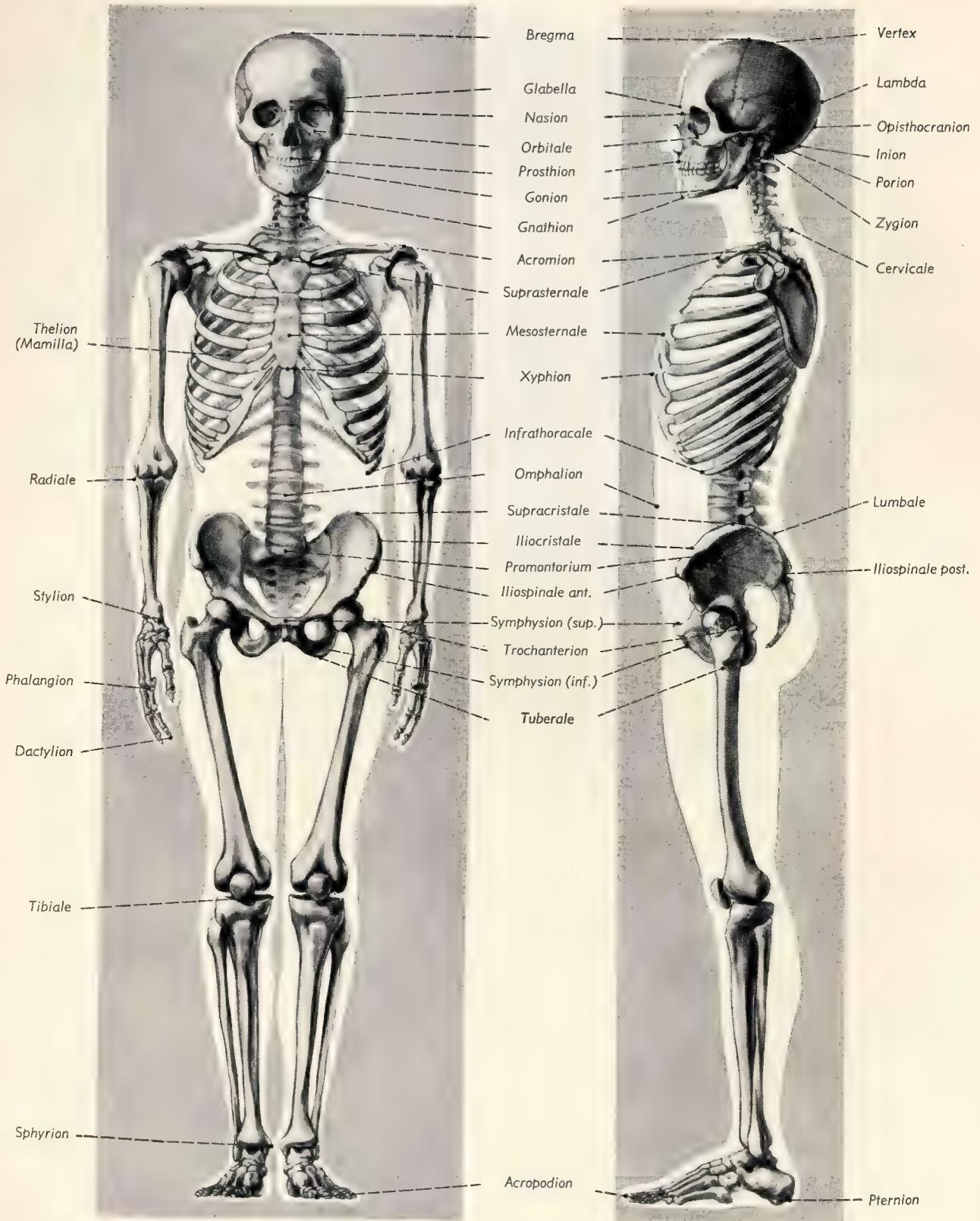


Fig. 1. Skeleton of the human body viewed from the front and from the left side. The more important points for skeletal measurements are indicated.

Fig. 1

Acromion (tip of shoulder): Flat, lateral projection of the scapular spine overhanging the shoulder joint; origin of the trapezius and deltoid muscles.

Acropodium: The most distant soft part of the big toe.

Bregma (named by Aristotle): Point of junction of the coronal and sagittal sutures; craniometric point.

Cervicale: Anthropol., somatometric point; spine of the seventh cervical vertebra.

Dactylion: The most distal point on the middle finger of a hanging limb. Corresponding points on the remaining fingers are designated dactylion I, II, IV or V.

Glabella (L., small bald spot): 1) Anat., slightly curved part of the frontal bone between the superciliary arches, deep to an area of hairless skin. 2) Anthropol., an elevation on the forehead above the root of the nose between the eyebrows; a point above the nasofrontal suture between the superciliary arches.

Gnathion: The most prominent point in the median plane on the lower margin of the mandible.

Gonion: 1) Anat., the angle of the mandible. 2) Anthropol., the lowest, most posterior and externally located point on the angle of the mandible; a craniometric point at the intersection of a line along the inferior border of the body of the mandible with that along the posterior border of the ramus.

Iliocrista: The farthest laterally projecting point on the iliac crest.

Iliospinale anterius: The most downward projecting point of the anterior superior iliac spine; an osteometric point.

Iliospinale posterius: The most backward projecting point of the posterior superior iliac spine; an osteometric point.

Infrathoracale: The most lateral point on the lower margin of the bony thorax (here, the tip of the eleventh rib).

Inion: The point of the external occipital protuberance; a cephalometric and craniometric point.

Lambda: Anthropol., a point at the intersection of the sagittal and lambdoid sutures.

Lumbale: The tip of the spinous process of L5; a somatometric point.

Mesosternale: Point of intersection of a line connecting the fourth sternocostal joints with the median plane; a somatometric point.

Nasion (nasale): Point of intersection of the nasofrontal suture with the median plane; a craniometric point.

Omphalion (navel point): Central point of the umbilicus in the median plane; a somatometric point.

Opisthocranion: Most prominent point on the posterior aspect of the skull in the median plane used for measuring the greatest longitudinal diameter of the cranium.

Orbitale: Lowermost point on the inferior margin of the orbit.

Phalangion: Somatometric point on the dorsal aspect of the proximal surface of the metacarpophalangeal joint.

Porion: Craniometric point in the center of the upper margin of porus acusticus ext. "Skin-porion" at the corresponding site in the living.

Promontorium: More or less prominent anterior projection of the upper edge of the first sacral vertebra, forming an angle with L5 (up to 90 degrees).

Prosthion (upper alveolar point): Point of the most downward projecting alveolar process in the midline between the upper medial incisors.

Pterion: The farthest dorsally projecting (somatometric) point on the calcaneus of a weight-bearing foot.

Radiale: The highest (somatometric) point on the upper edge of the head of the radius (with the arm hanging by the side and the palm facing medially).

Sphyrion: Tip of the medial malleolus when standing.

Stylium: Tip of the styloid process of the radius with the arm hanging.

Supracristale: Highest point on the iliac crest in the lateral line.

Suprasternale (upper sternal point): Somatometric point in the jugular notch of sternum, in the median plane.

Symphysion (superior, interior): Somatometric point in the midline on the upper and lower borders of the symphysis, respectively.

Thelion (mamelon, mamillary point): Midpoint of the nipple; somatometric point (except in women with pendulous breasts).

Tibiale: Highest point on the proximal joint surface of the tibia in erect posture.

Trochanterion: Highest and most lateral point on the greater trochanter.

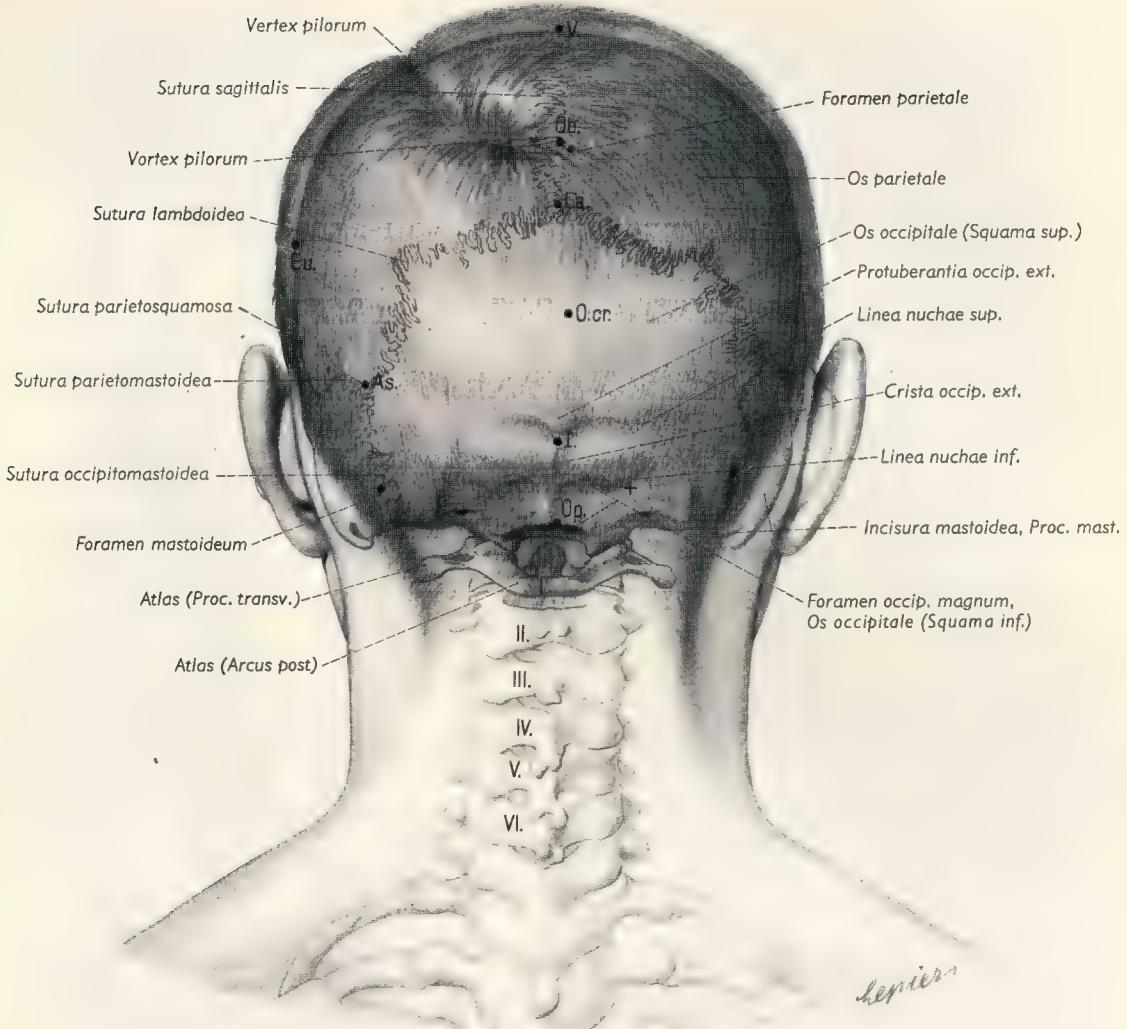
Tuberale: Lowest point on the downward projecting ischial tuberosity.

Vertex (crown): In erect posture, the highest point on the skull in the midline.

Xyphion: Suture between the body of sternum and the zyphoid process in the midline.

Zygion: The most lateral point on the zygomatic bone (zygomatic arch).

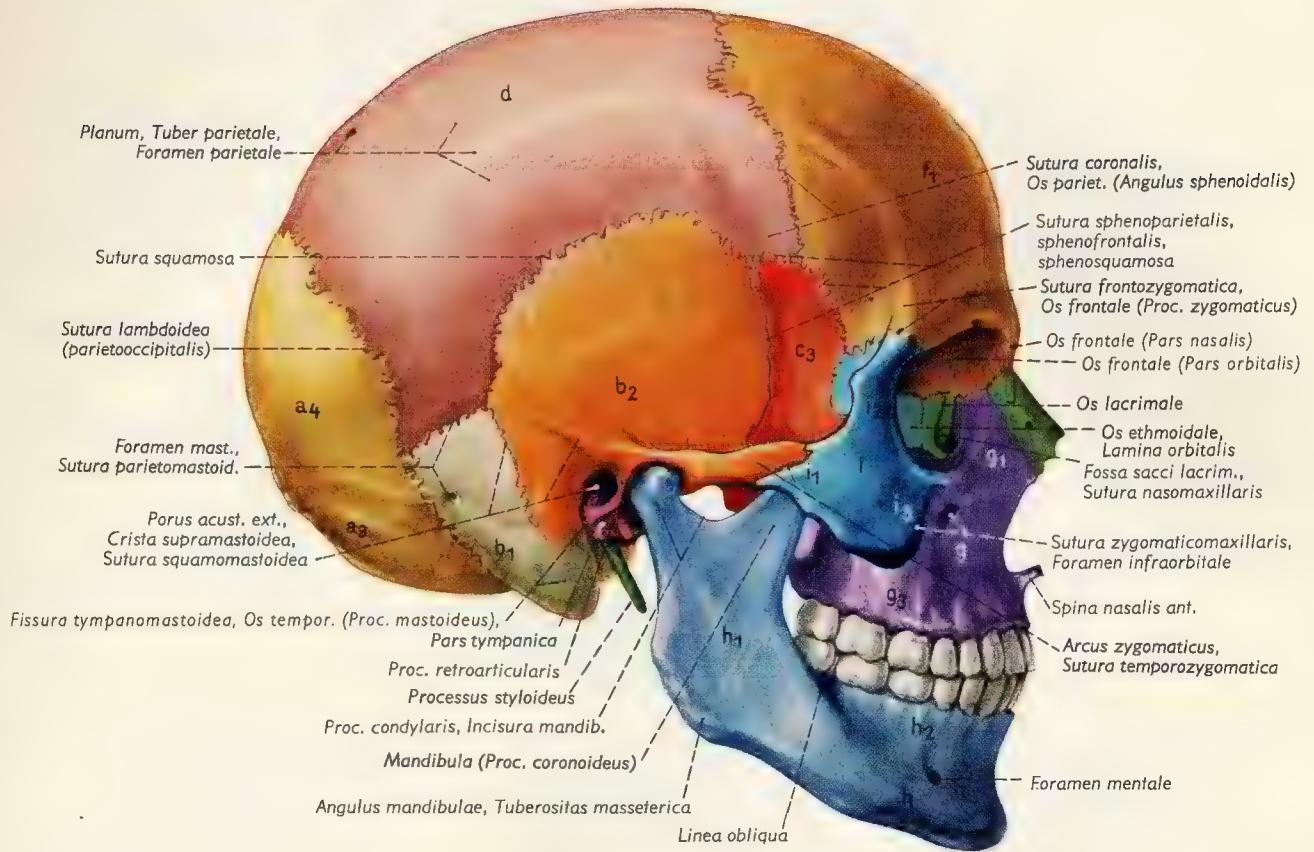
Fig. 1



+ = Pressure point for
 N. occipitalis major
 I-VI = 1.-6. Cervical vertebrae
 As = Asterion
 Eu = Euryon
 I = Inion

La = Lambda
 Ob = Obelion
 O. cr = Opisthocranion
 Op = Opisthion
 V = Vertex

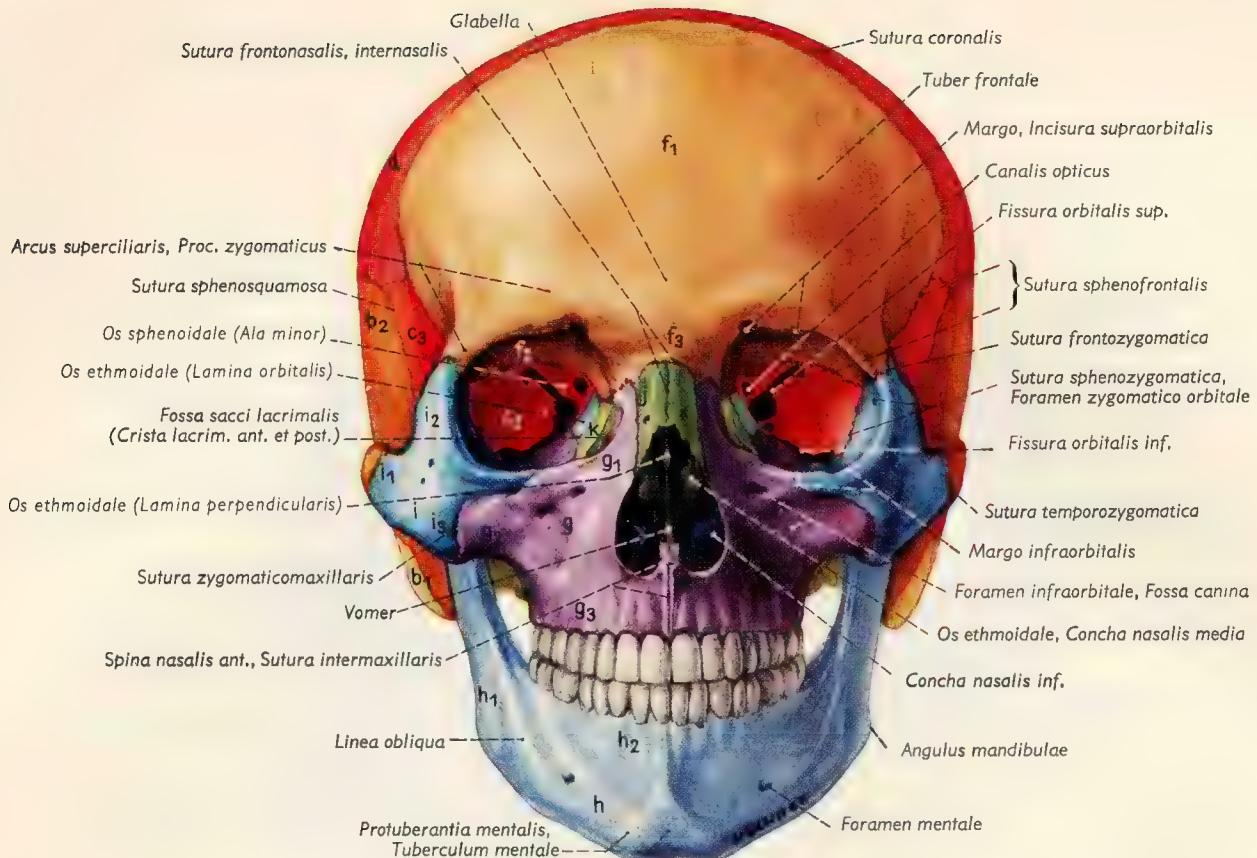
Fig. 2. External aspect of the male head viewed from behind, superimposed on the skeletal parts.



a₃, a₄ = Squama occipitalis
 b₁ = Os temporale, Pars mastoidea
 b₂ = Os temporale, Pars squamosa
 c₃ = Os sphenoidale, Ala major
 d = Os parietale
 f₁ = Squama frontalis
 g = Maxilla (Corpus)
 g₁ = Maxilla, Processus frontalis
 g₃ = Maxilla, Processus alveolaris
 h = Mandibula (Corpus)
 Angulus mandibulae, Tuberositas masseterica
 Fissura tympanomastoidea, Os tempor. (Proc. mastoideus),
 Proc. retroarticularis
 Processus styloideus
 Proc. condylaris, Incisura mandib.
 Mandibula (Proc. coronoideus)
 Foramen mast.,
 Sutura parietomastoid.
 Porus acust. ext.,
 Crista supramastoidea,
 Sutura squamomastoidea
 Sutura lambdoidea
 (parietooccipitalis)
 Sutura squamosa
 Planum, Tuber parietale,
 Foramen parietale
 d

h₁ = Mandibula (Ramus)
 h₂ = Mandibula, Processus alveolaris
 i = Os zygomaticum
 i₁ = Os zygomaticum, Processus temporalis
 i₂ = Os zygomaticum, Processus frontalis
 i₃ = Os zygomaticum, Processus maxillaris
 j = Os nasale
 Linea obliqua
 Foramen mentale

Fig. 3. Right side of an adult skull. The bones of the neurocranium and the visceral cranium are shown in different colors; visceral cranium: blue, violet and green.



Key to Figs. 4 and 5

a_3 = Lower part of squama occipitalis
 a_4 = Upper part of squama occipitalis
 b_1 = Os temporale, Pars petrosa
 b_2 = Os temporale, Squama
 c_3 = Os sphenoidale, Ala major
 d = Os parietale
 f_1 = Os frontale, Squama

f_2 = Os frontale, Pars orbitalis
 f_3 = Os frontale, Pars nasalis
 g = Maxilla (Corpus)
 g_1 = Maxilla, Proc. frontalis
 g_2 = Maxilla, Proc. zygomaticus
 g_3 = Maxilla, Proc. alveolaris
 g_4 = Maxilla, Processus palatinus
 h = Mandibula (Corpus)

h_1 = Mandibula (Ramus)
 h_2 = Mandibula, Proc. alveolaris
 i = Os zygomaticum
 i_1 = Proc. temporalis
 i_2 = Proc. frontalis, Os zygomaticum
 i_3 = Proc. maxillaris, Os zygomaticum
 j = Os nasale
 k = Os lacrimale

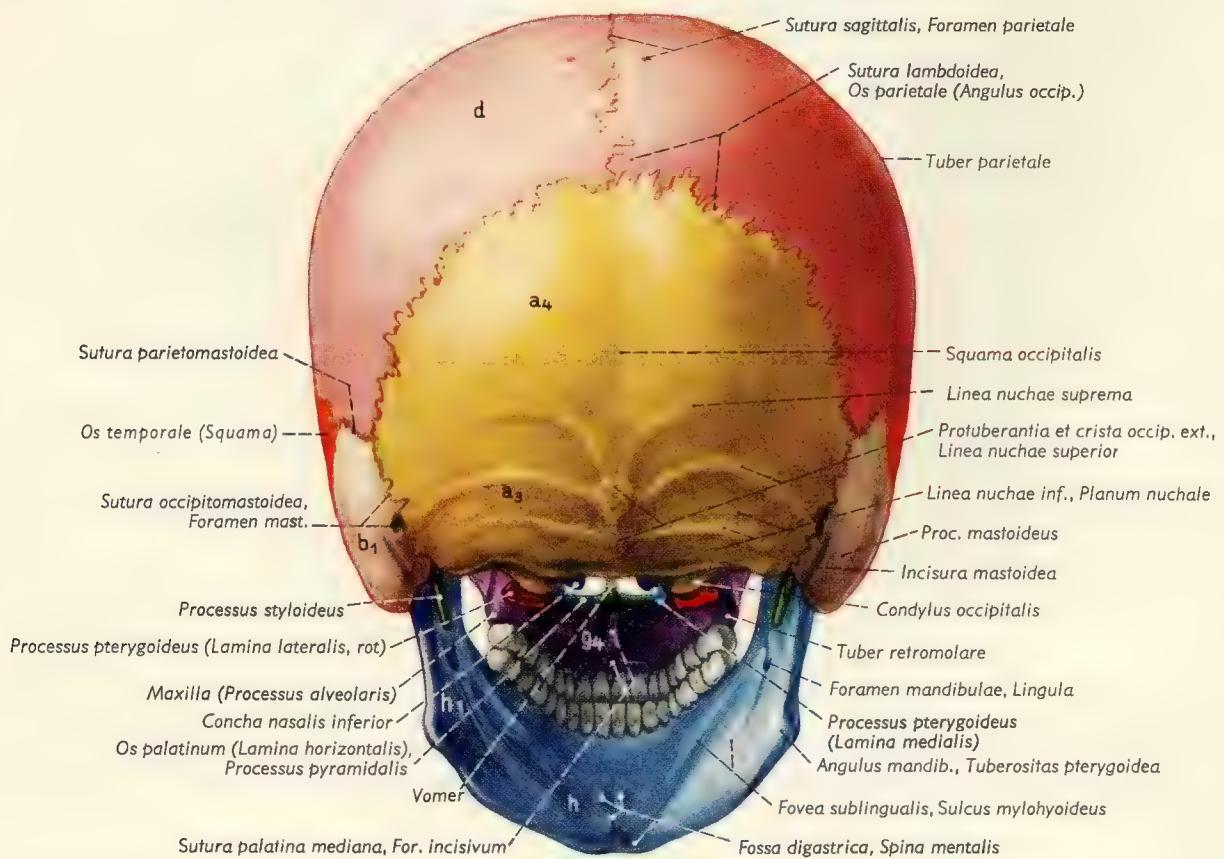
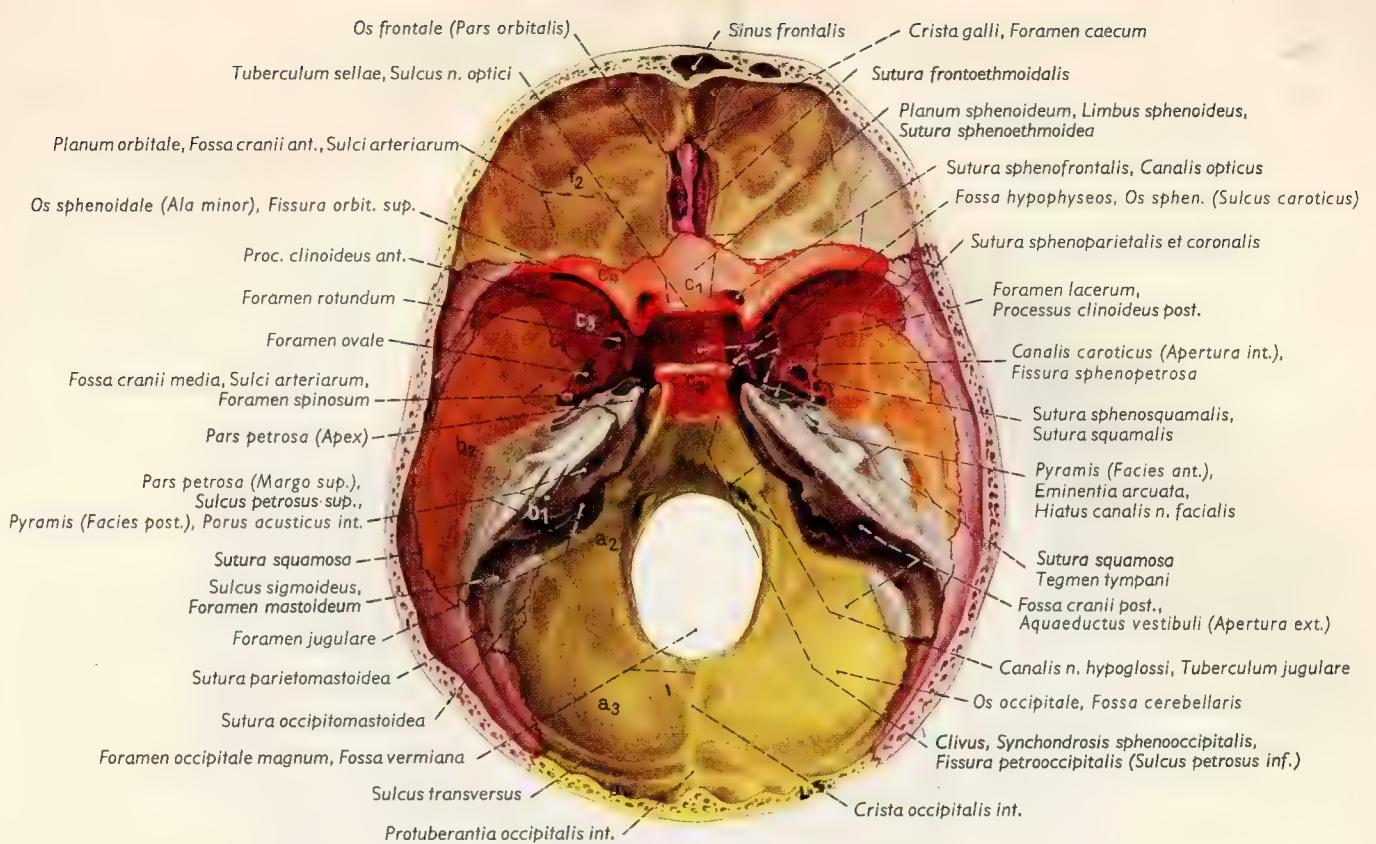


Fig. 4. (Top) Adult skull from the front (neurocranum: yellow, orange and red; viscerocranum: blue, violet and green).

Fig. 5. (Bottom) Adult skull seen from behind.



Key to Figs. 6 and 7

Key to Figs. 6 and 7

a_1	= Os occipitale, Pars basilaris
a_2	= Os occipitale, Pars lateralis
a_3	= Os occipitale
a_4	= Squama occipitalis

- b_1 = Os temporale, Pars petrosa
- b_2 = Os temporale, Squama
- c_1 = Os sphenoidale
- c_2 = Os sphenoidale
(Os basisphenoideum), Corpus

- c₃ = Os sphenoidale, Ala major
- c₄ = Os sphenoidale, Ala minor
- d = Os parietale
- f₁ = Squama frontalis
- f₂ = Os frontale, Pars orbitalis
- j = Os nasale

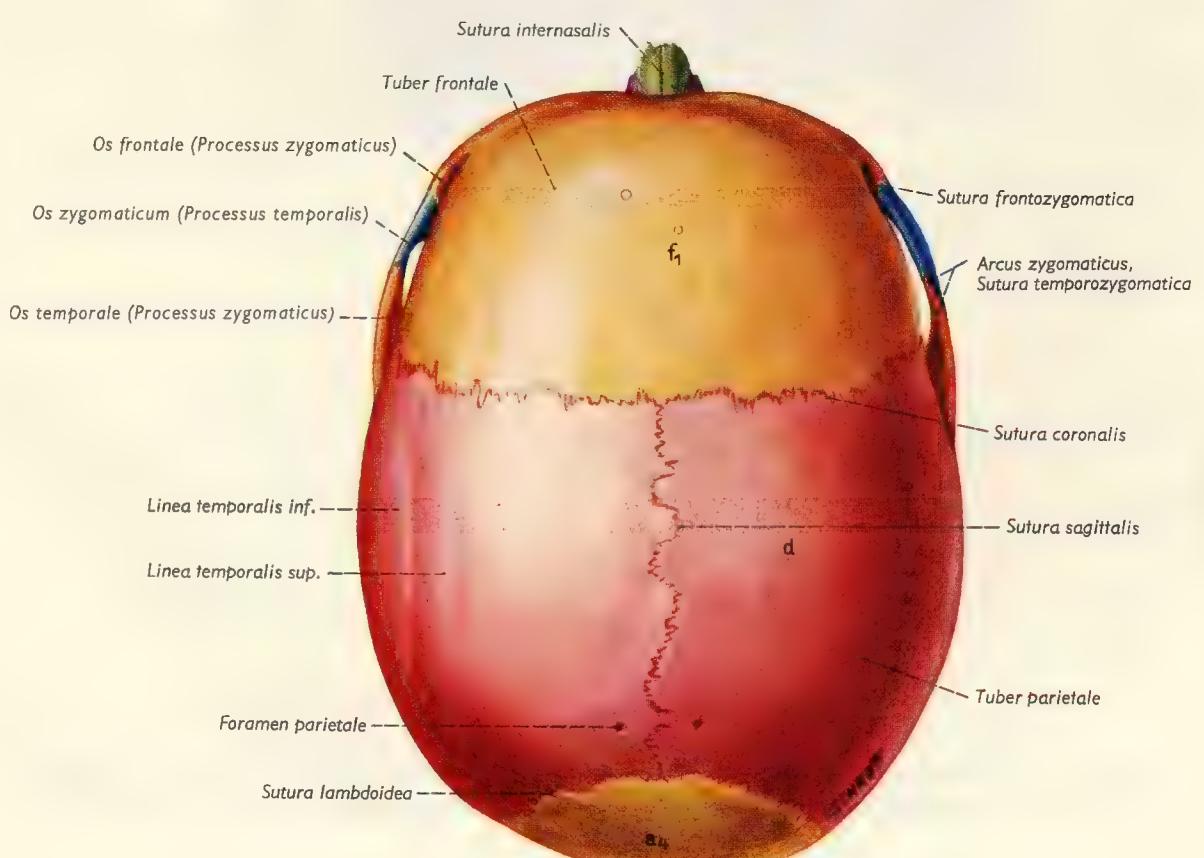
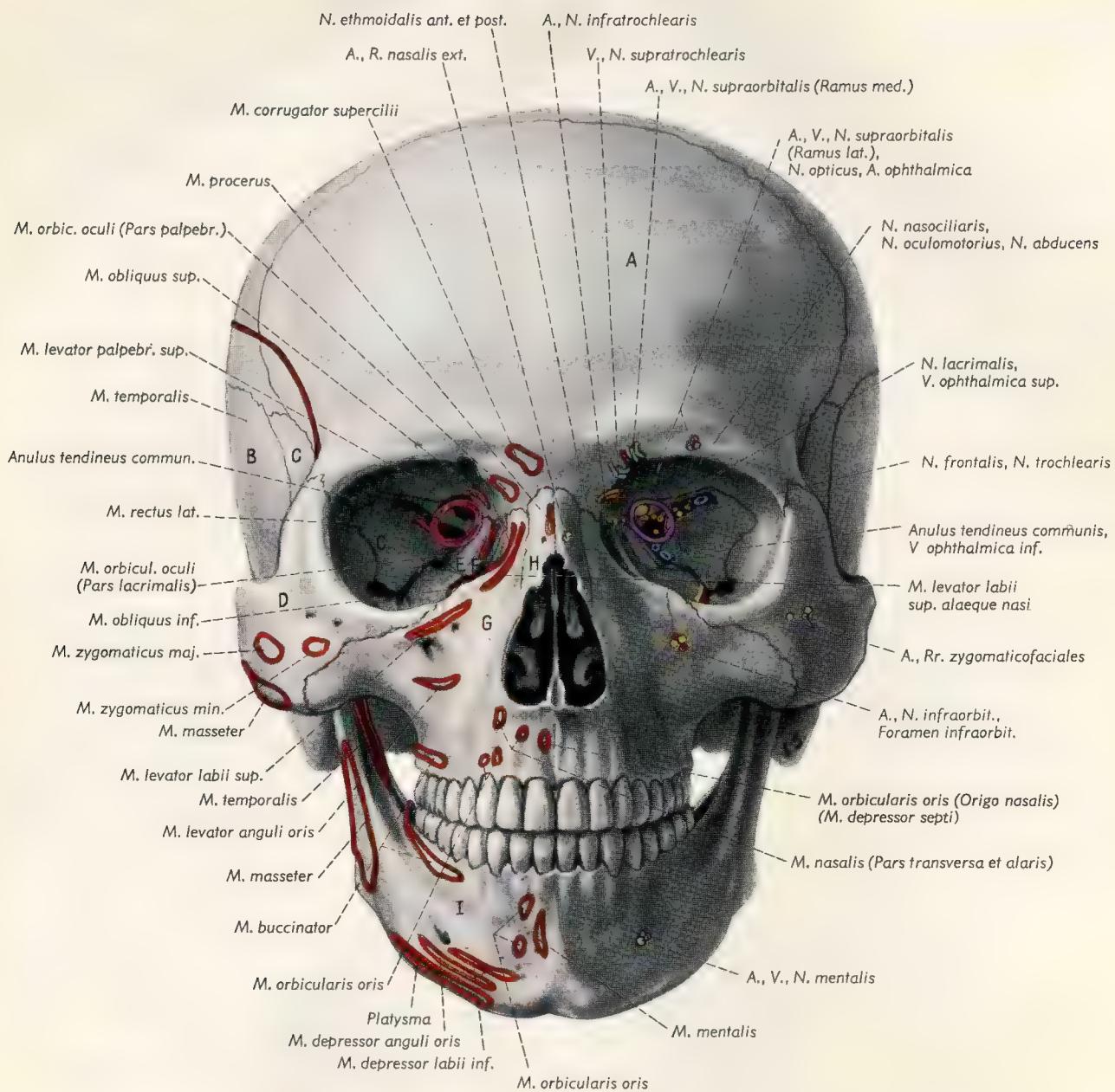


Fig. 6. (Top) Base of skull seen from the inside.

Fig. 7. (Bottom) Adult human skull seen from above (calvaria, skullcap).

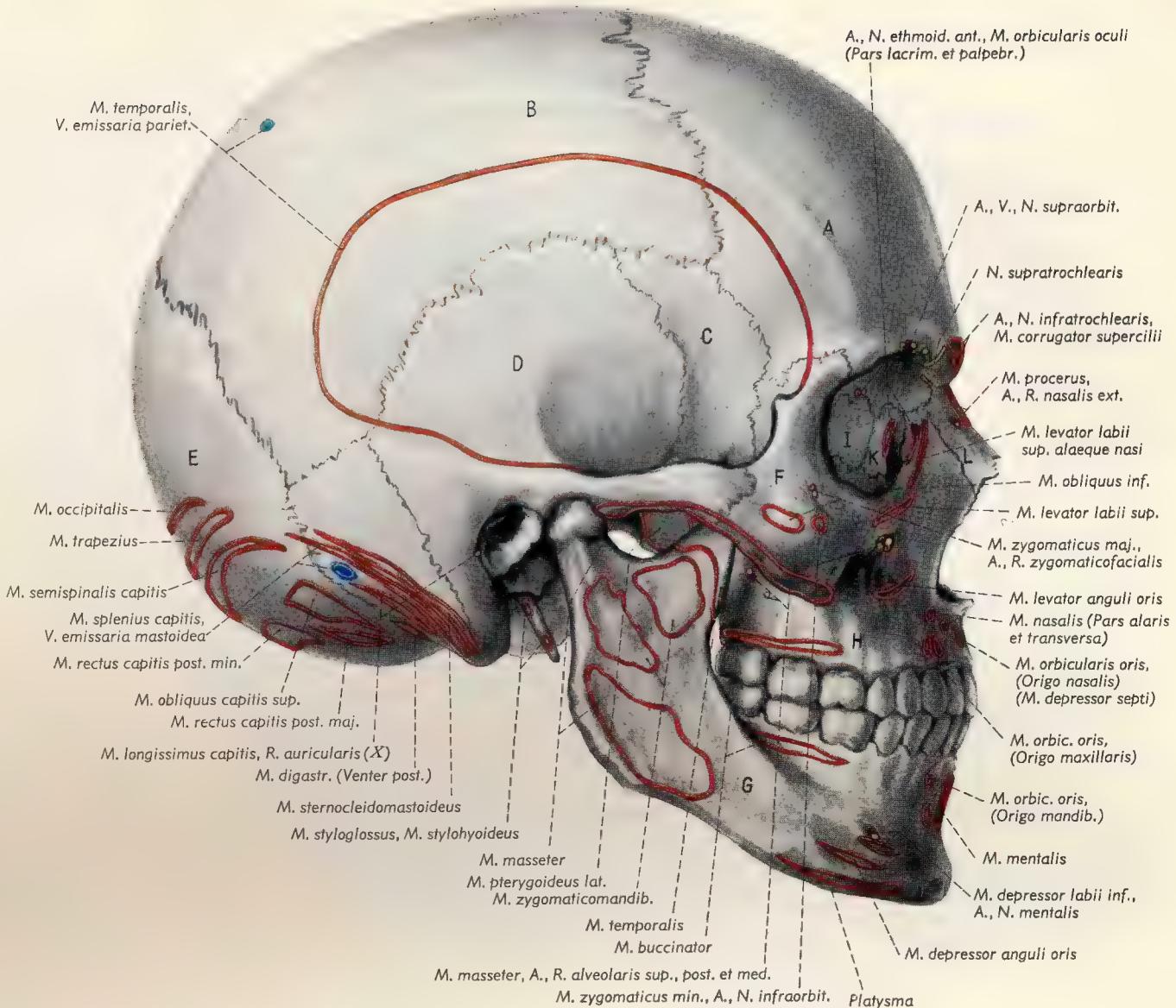


A = Os frontale
B = Os temporale
C = Os sphenoidale

D = Os zygomaticum
E = Os ethmoidale (Lamina orbitalis)
F = Os lacrimale

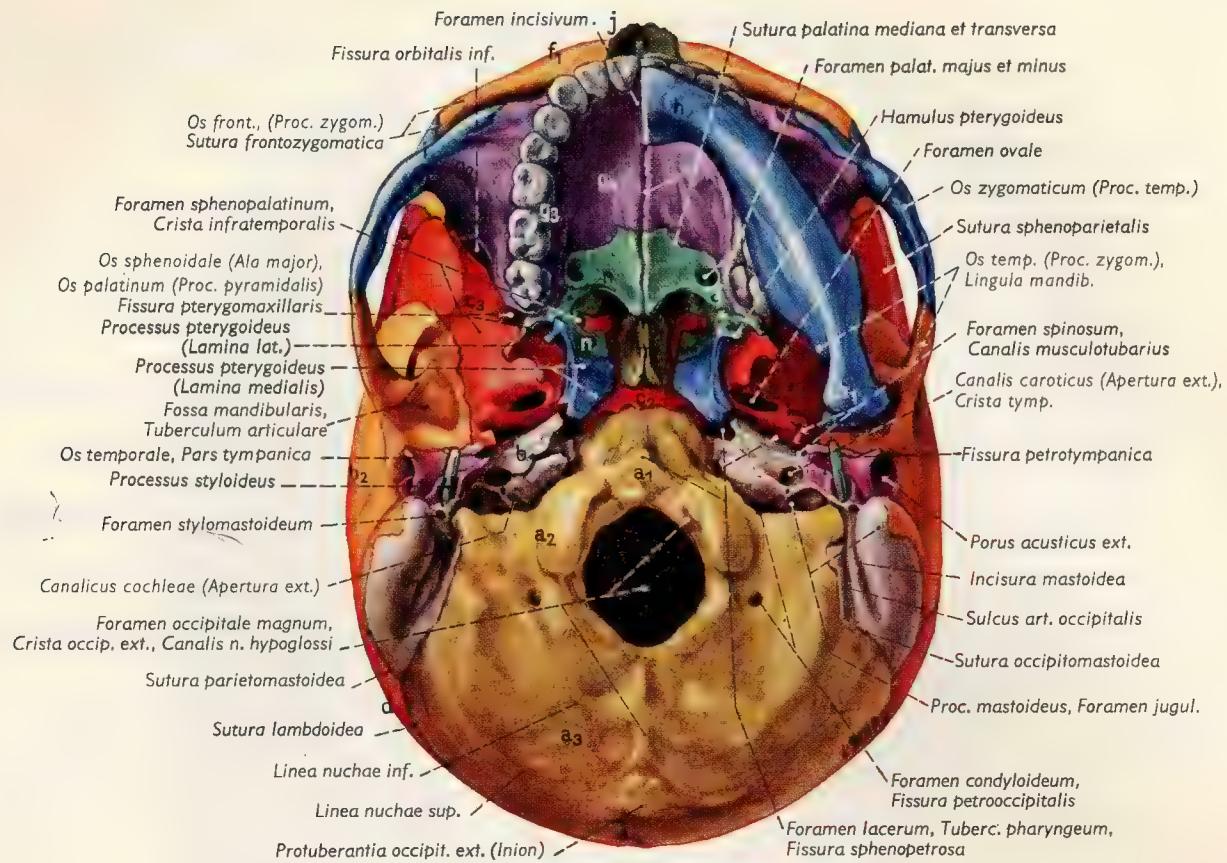
G = Maxilla
H = Os nasale
I = Mandibula

Fig. 8. The skull from the front. On the right, areas of muscle attachments are encircled in brown. On the left, blood vessels and nerves are indicated where they pass through foramina.



A = Os frontale	E = Os occipitale	I = Os ethmoid. (Lamina orbitalis)
B = Os parietale	F = Os zygomaticum	K = Os lacrimale
C = Os sphenoidale	G = Mandibula	L = Os nasale
D = Os temporale	H = Maxilla	

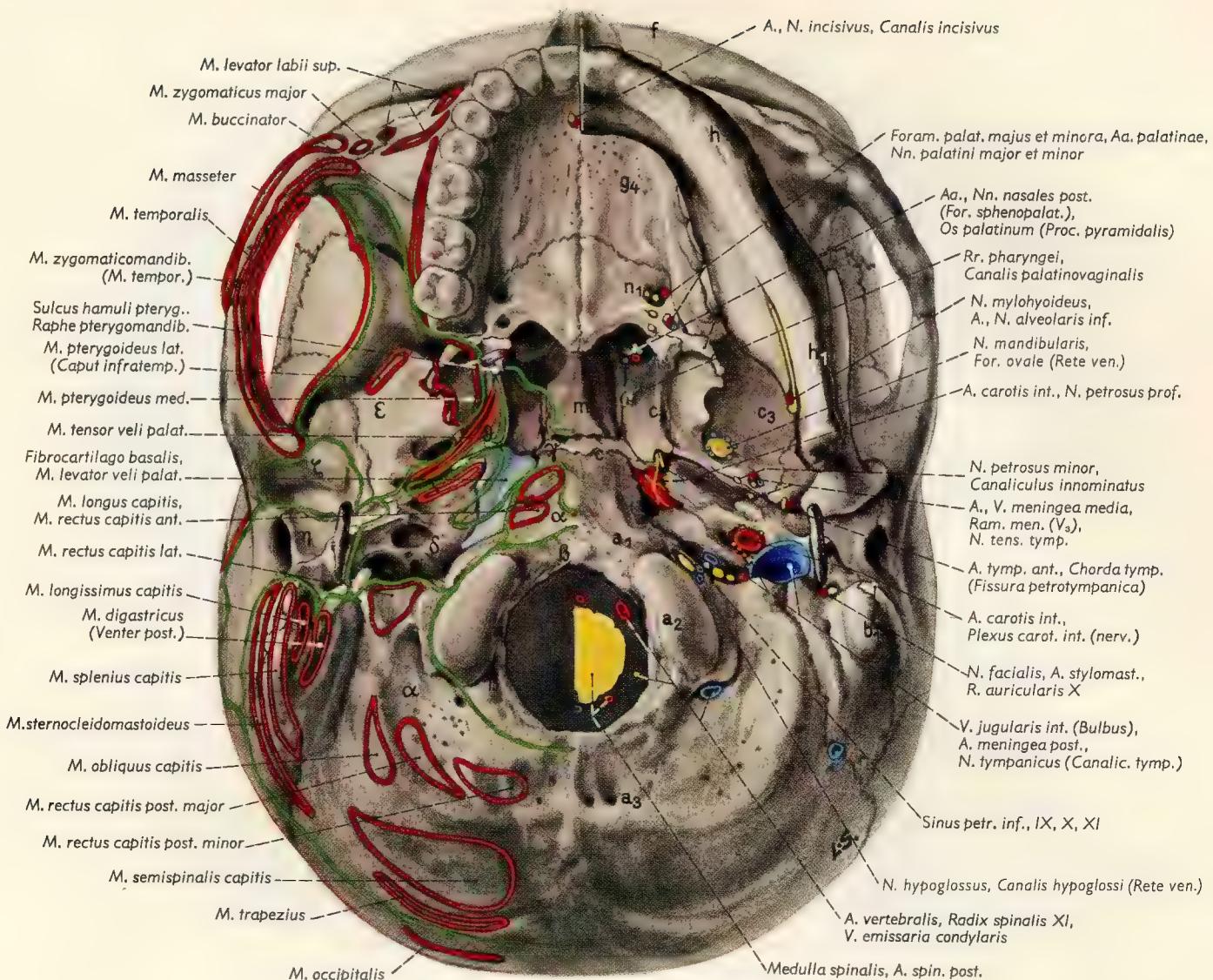
Fig. 9. Lateral view of skull. Areas of muscle attachments are encircled in brown.



a = Os parietale
 a₁ = Os occipitale, Pars basilaris
 a₂ = Os occipitale, Pars lateralis
 a₃ = Unterschuppe des Os occipitale
 a₄ = Oberschuppe des Os occipitale
 b₁ = Os temporale, Pars petrosa
 b₂ = Os temporale, Pars squamosa
 c₂ = Os sphenoidale (Basisphenoid)
 c₃ = Os sphenoidale, Ala major
 d = Os parietale
 (Angulus mastoideus et sphenoideus)

f₁ = Os frontale, Squama
 g₂ = Maxilla, Processus zygomaticus
 g₃ = Maxilla, Processus alveolaris
 g₄ = Maxilla, Processus palatinus
 h = Mandibula, Corpus
 h₁ = Mandibula, Ramus, Angulus
 i = Os zygomaticum
 j = Os nasale
 m = Vomer
 n = Os palatinum, Lamina horizontalis

Fig. 10. The bony base of the skull from below. The right half of the mandible has been removed.

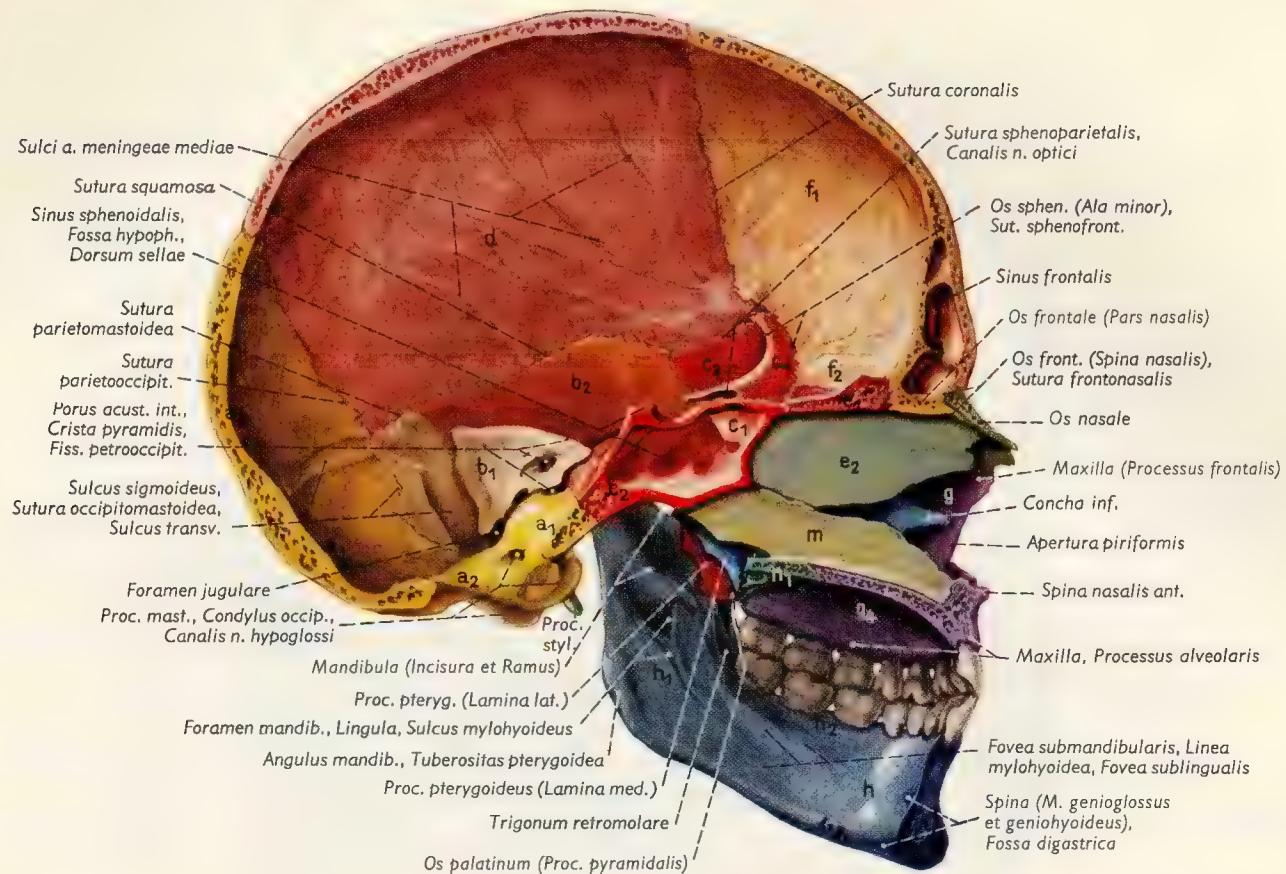


α = Area vertebroneurhalis (nuchalis)
 β = Area vertebralis
 γ = Area pharyngea
 δ = Area vasorum et nervorum
 ε = Area infratemporalis
 ζ = Area articularis
 η = Area auditiva (acustica)
 ϑ = Area parapharyngea

 a_1 = Os occipitale, Basis
 a_2 = Os occipitale, Pars lateralis

a_3 = Os occipitale, Squama
 b_1 = Proc. mastoideus
 c = Os sphenoidale, Corpus
 c_3 = Os sphenoidale, Ala major
 c_5 = Processus pterygoideus
 f = Os frontale
 g_4 = Maxilla, Processus palatinus
 h = Mandibula, Corpus
 h_1 = Mandibula, Ramus
 m = Vomer
 n_1 = Os palatinum, Lamina horizontalis

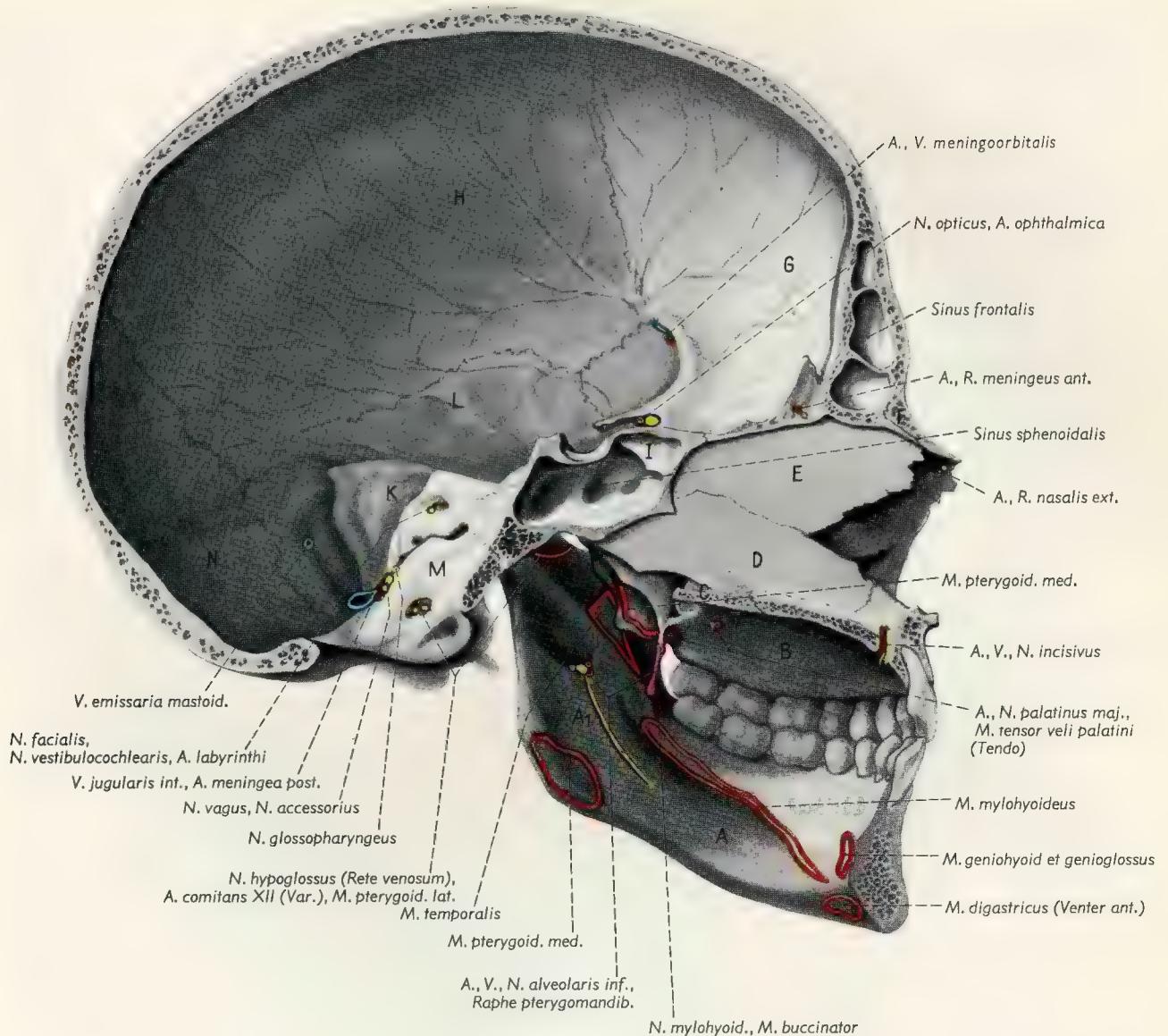
Fig. 11. The base of the cranium and its areas of muscle attachments seen from below. The right half of the mandible has been removed. On the right side, the areas of muscle origins are encircled in brown; other basal cranial areas (see key) are outlined in green. On the left, vessels and nerves are indicated where they pass through foramina.



a_1 = Os occipitale, Pars basilaris
 a_2 = Os occipitale, Pars lateralis
 a_3 = Squama occipitalis
 b_1 = Os temporale, Pars petrosa
 b_2 = Os temporale, Pars squamosa
 c_1 = Os sphenoidale (Os praesphenoidale)
 c_2 = Os sphenoidale (Os basisphenoidale)
 c_3 = Os sphenoidale, Ala major
 c_4 = Os sphenoidale, Ala minor
 d = Os parietale

e_1 = Os ethmoidale, Lamina cribrosa
 e_2 = Os ethmoidale, Lamina perpendicularis
 f_1 = Os frontale, Squama
 f_2 = Os frontale, Pars orbitalis
 g = Maxilla, Corpus
 g_4 = Maxilla, Processus palatinus
 h = Mandibula, Corpus
 h_1 = Mandibula, Ramus
 h_2 = Mandibula, Pars alveolaris
 m = Vomer
 n_1 = Os palatinum, Lamina horizontalis

Fig. 12. Adult skull, midsagittal section (left half).



A = Mandibula, Corpus
 A₁ = Mandibula, Ramus
 B = Maxilla
 C = Os palatinum
 D = Vomer

E = Os ethmoid., Lamina perpendicularis
 F = Os nasale
 G = Os frontale
 H = Os parietale

I = Os sphenoidale
 K = Pars petrosa
 L = Os temp., Pars squamosa
 M = Os occipitale, Pars basilaris
 N = Squama occipitalis

Fig. 13. Skull in median section (left half). Areas of muscle attachments are encircled in brown; vessels and nerves are indicated where they pass through foramina.

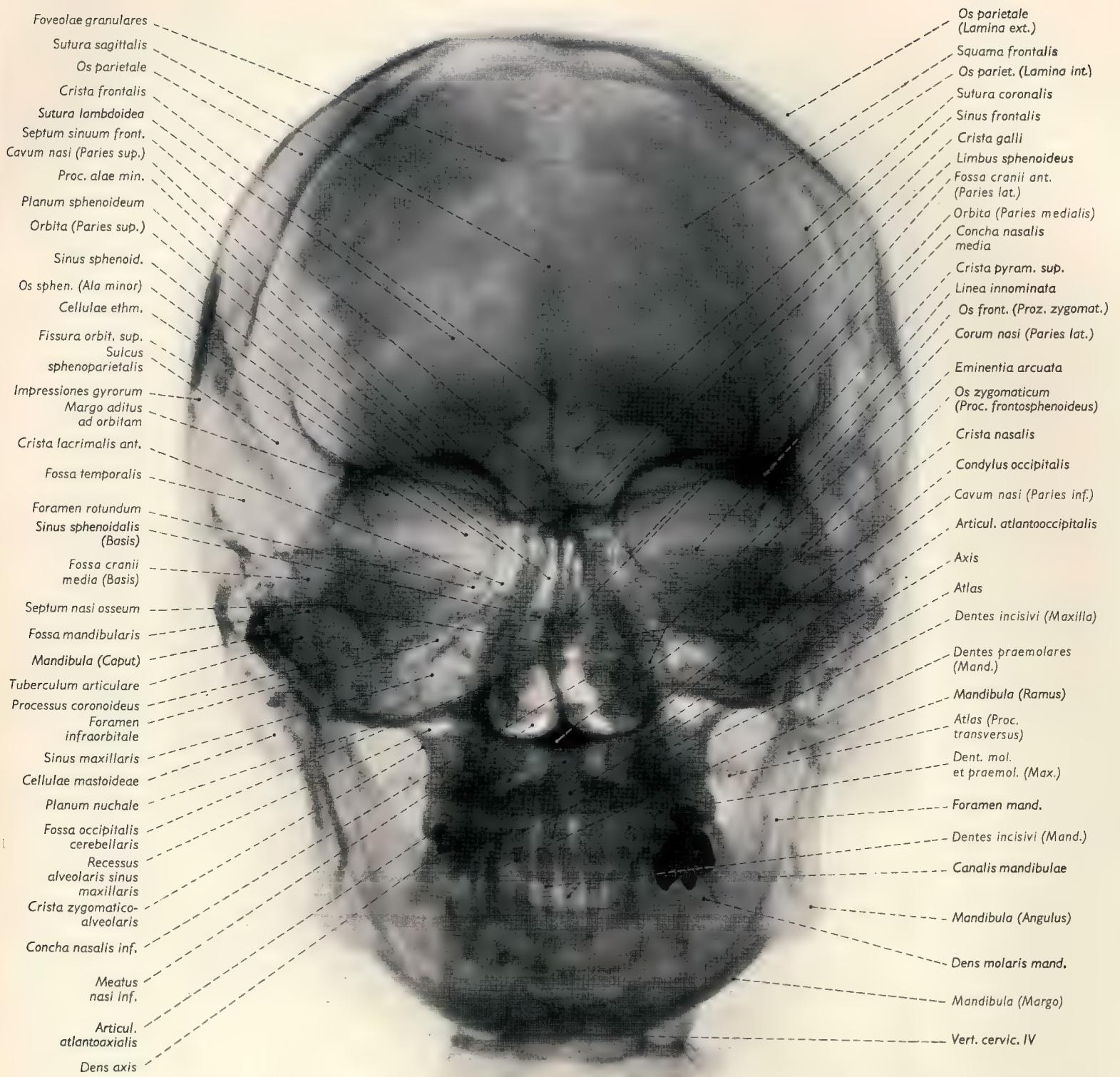


Fig. 14. Posteroanterior roentgenogram of skull
(from Clementschitsch).

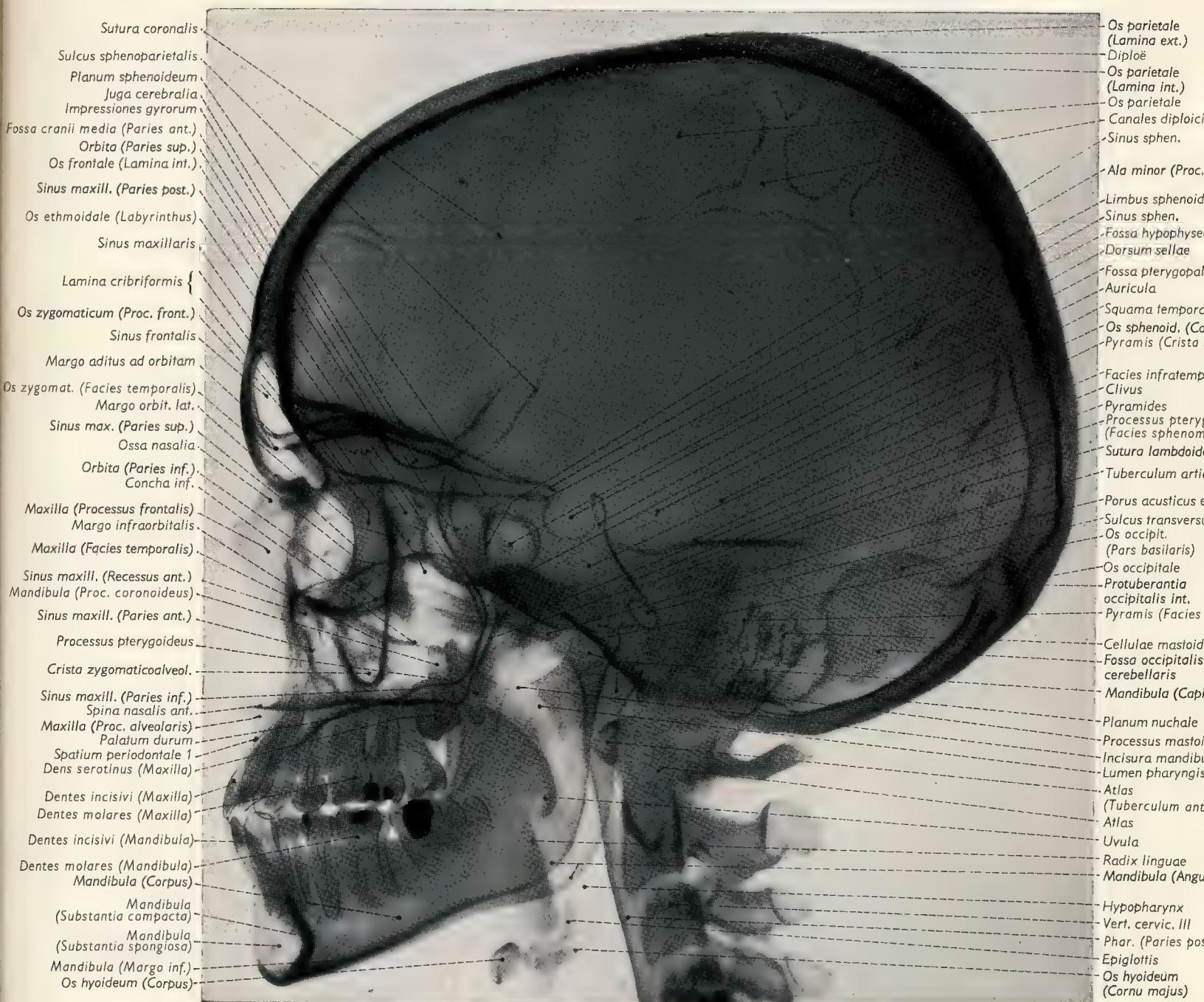


Fig. 15. Lateral roentgenogram of adult human skull
(from Clementschitsch).

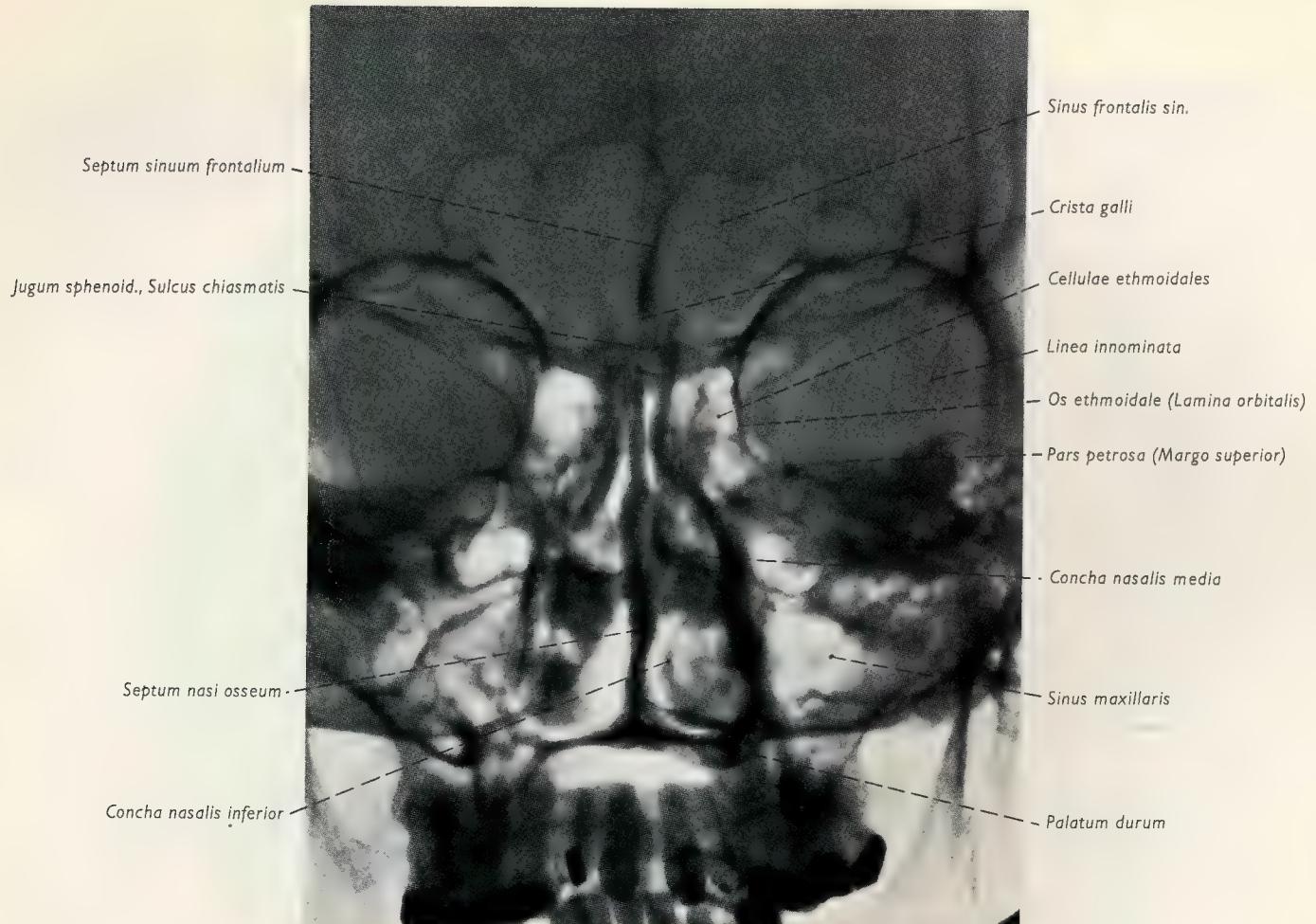


Fig. 16. Posteroanterior roentgenogram of paranasal sinuses I
(L. Wicke, Vienna).

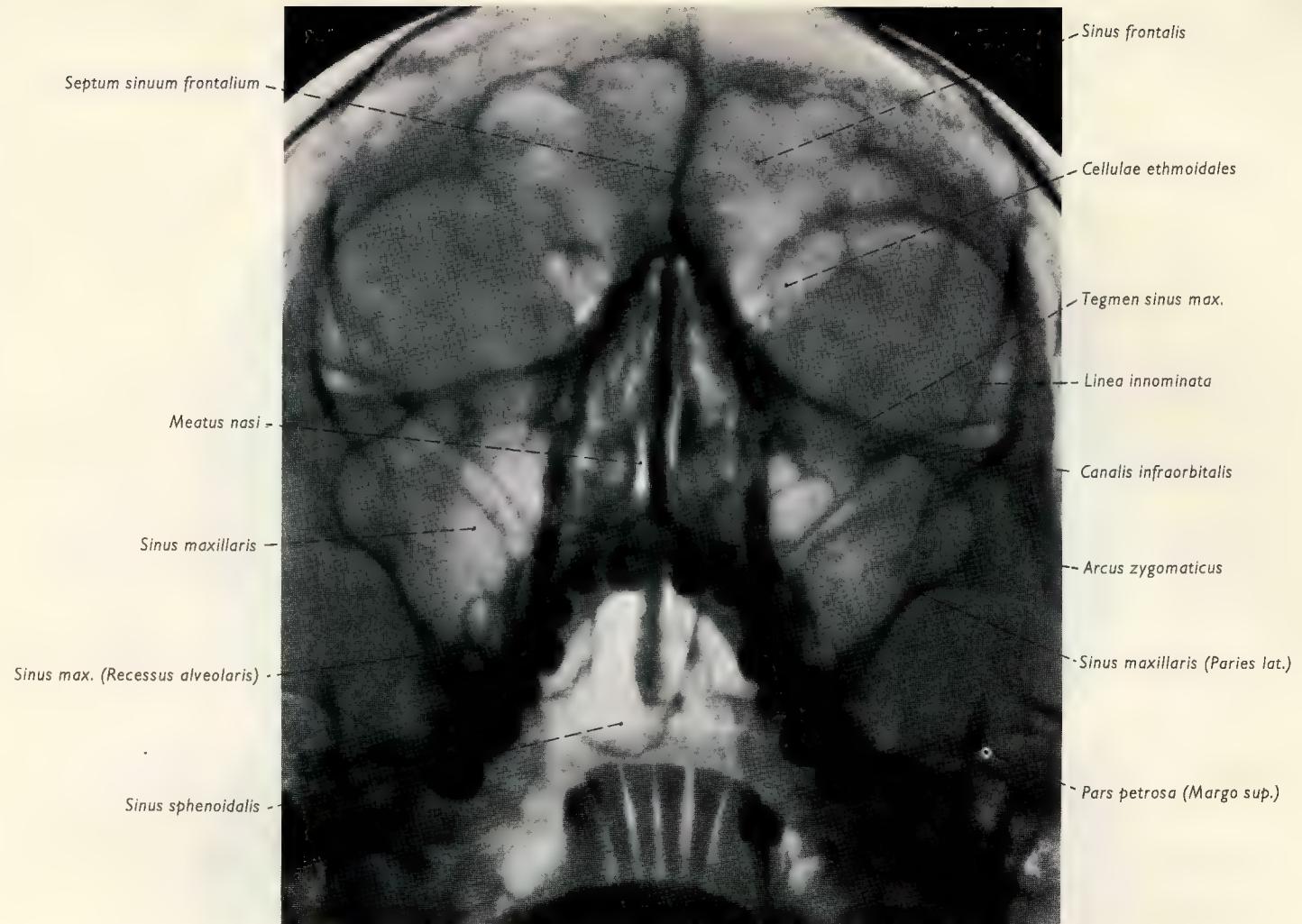
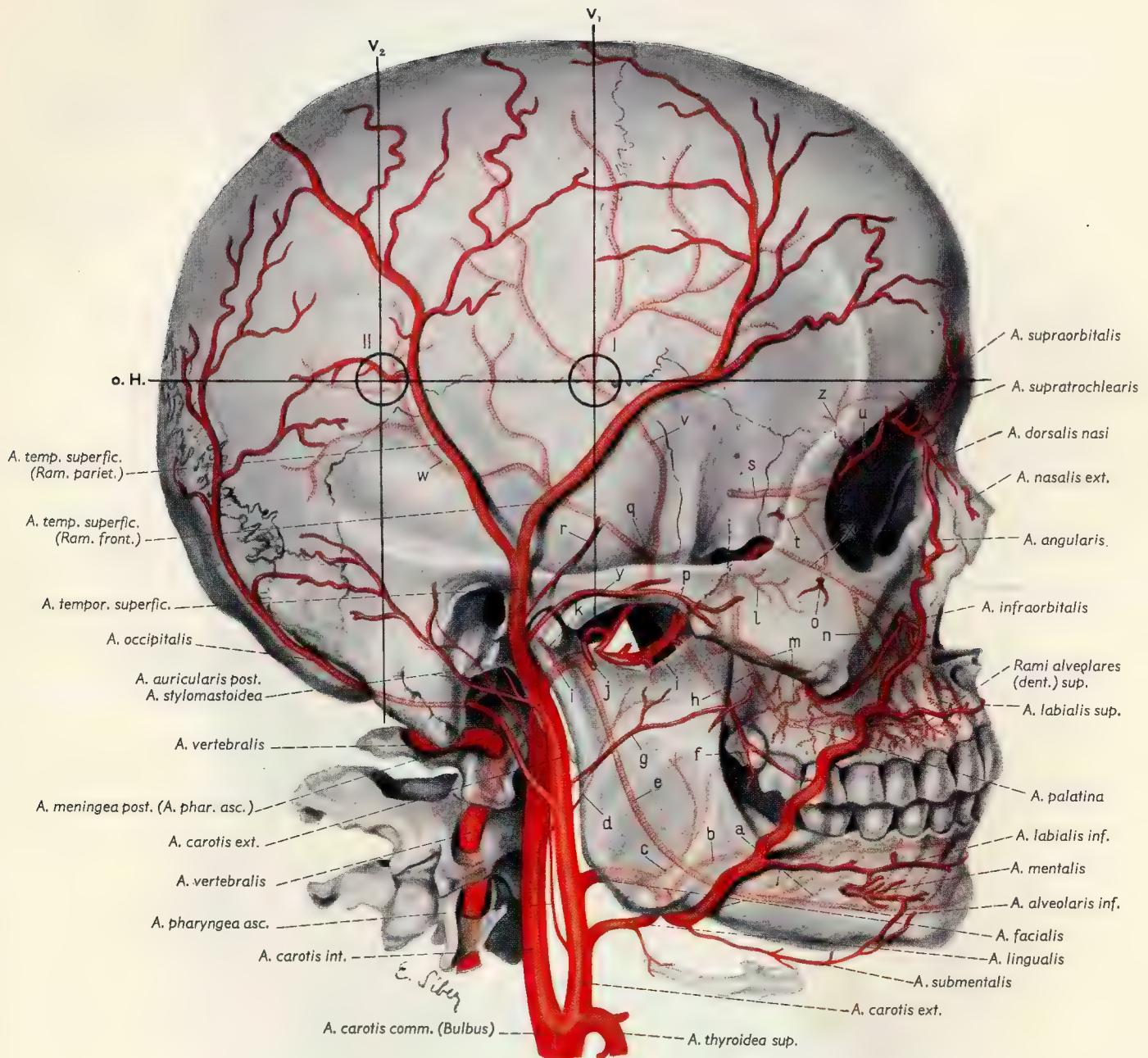


Fig. 17. (Top) Paranasal sinuses II; head is tilted back with mouth open (L. Wicke, Vienna).

Fig. 18. (Bottom) Paranasal sinuses III, axial view (L. Wicke, Vienna).

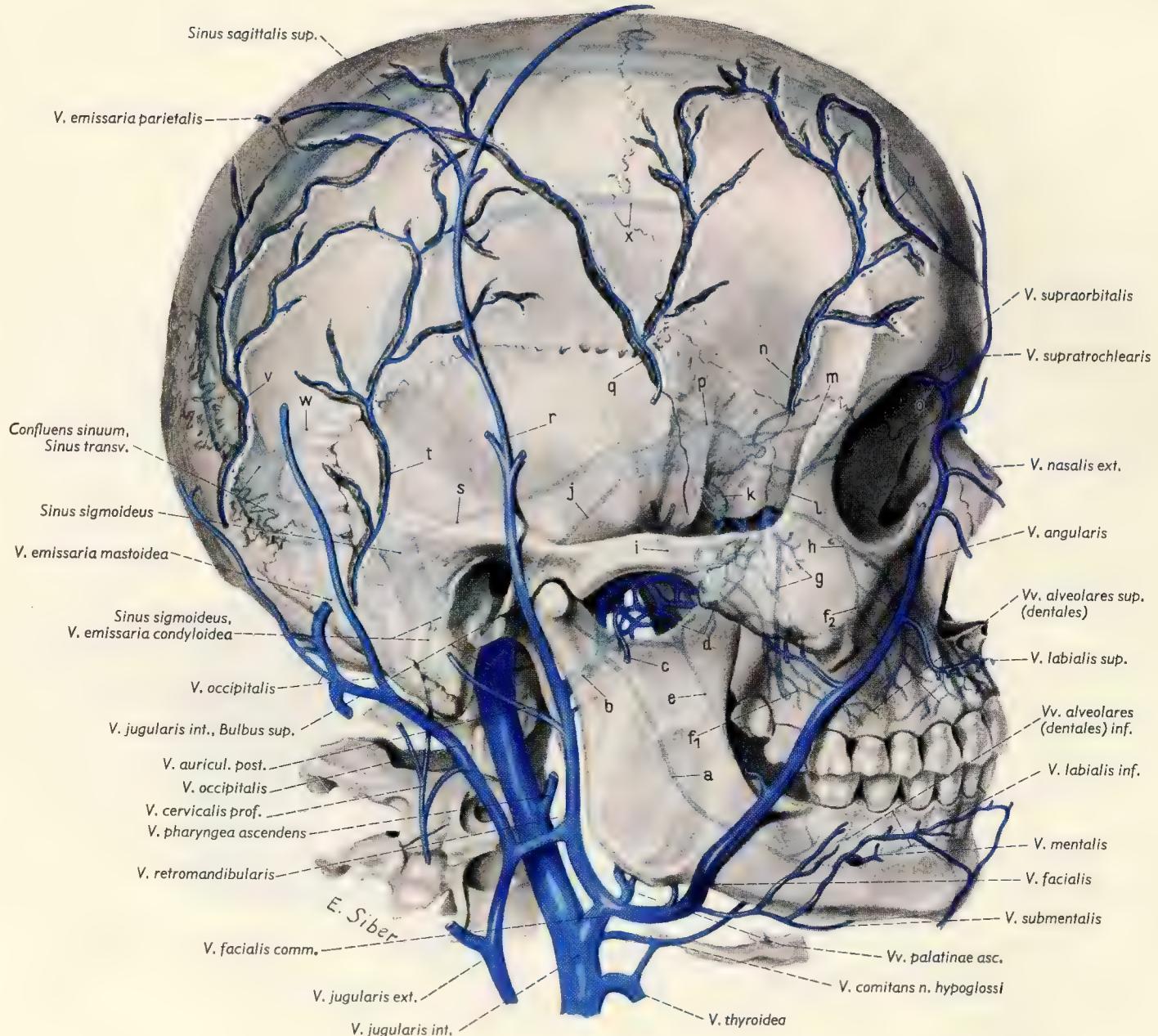


a = Rr. alveolar. (dentales) inf.
 b = A. profunda linguae
 c = A. palatina ascendens
 d = A. pharygea ascendens
 e = A. alveolaris inf.
 f = A. buccalis
 g = A. transversa faciei
 h = A. palatina descendens
 i = A. maxillaris (Pars mandibularis,
 pterygoidea et pterygopalatina)
 j = A. masseterica
 k = A. auricularis prof.

l = Aa. nasales post.
 (A. sphenopalatina)
 m = A. alveolaris sup. post.
 n = A. alveolaris sup. ant.
 o = A. zygomaticofacialis
 p = Aa. temporales prof.
 q = A. meningea (duralis) media
 r = A. temporalis media
 s = A. ophthalmica
 t = A. zygomaticotemporalis
 u = A. nasofrontalis

v = A. meningea media (R. ant.)
 w = A. meningea media (R. post.)
 x = A. infraorbitalis
 y = A. zygomatico-orbitalis
 z = A. ethmoidea ant.
 (meningea ant.)
 o. H. = Horizontal line
 (supraorbital margin)
 V₁ = Vertical line (middle
 of zygomatic arch)
 V₂ = Vertical line (posterior
 margin of mastoid)

Fig. 19. Semischematic representation of the large arteries of the head. Krönlein's points I and II are anterior and posterior trepanation sites for ligation of the middle meningeal artery.

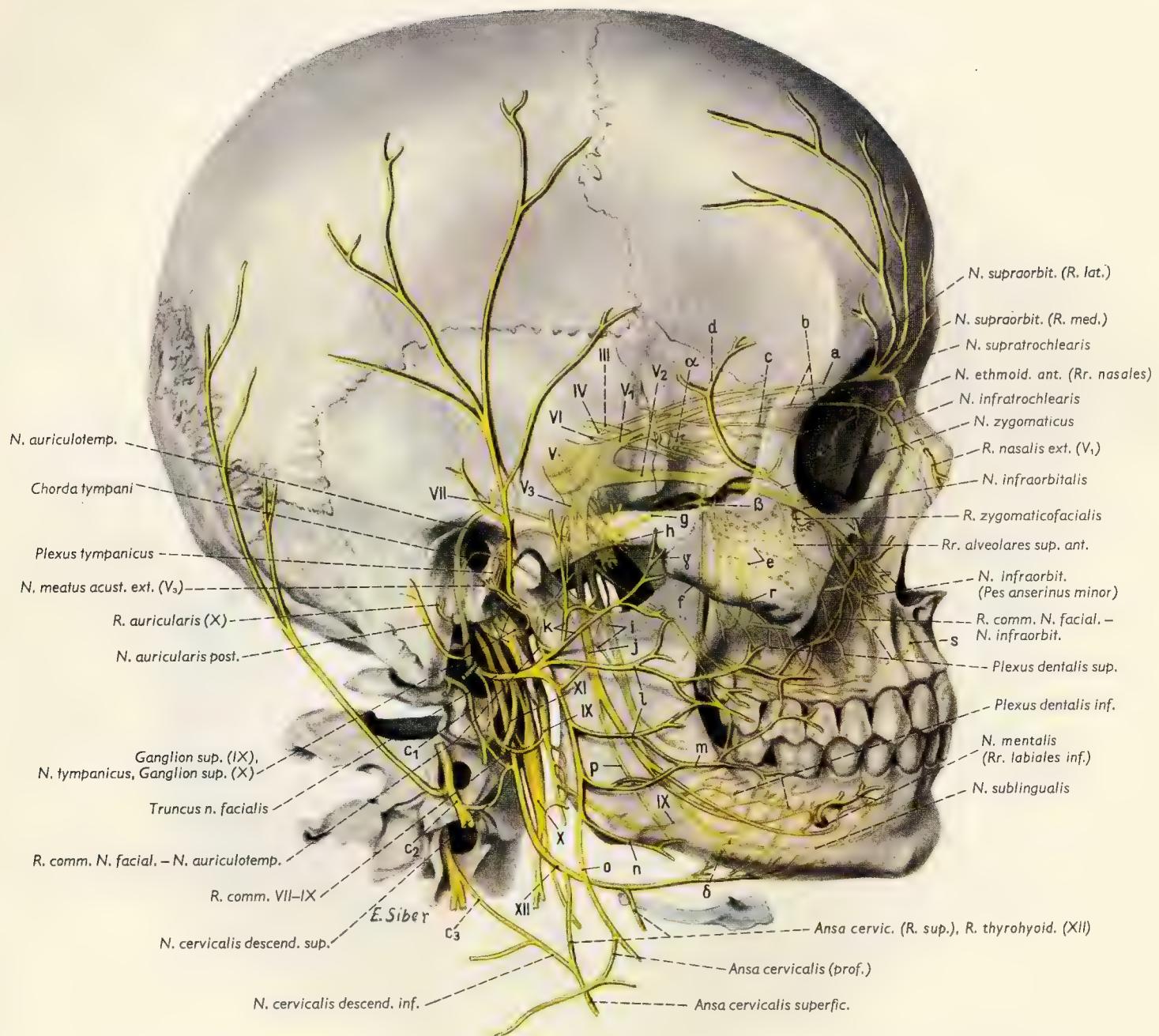


a = V. alveolaris inf.
 b = V. maxillaris
 c = V. masseterica
 d = Plexus ven. pterygoideus
 e = V. buccalis
 f₁ = Vv. alveolares sup. post.
 f₂ = Vv. alveolares sup. ant.
 g = V. palatina desc., Vv. nasales post.
 h = V. infraorbitalis

i = V. meningea media
 j = Sinus petrosus inf.
 k = Rete foraminis ovalis
 l = V. ophthalmica inf.
 m = V. ophthalmica sup.
 n = V. diploica temporalis ant.
 o = V. nasofrontalis
 p = Sinus cavernosus

q = V. diploica temporalis media
 r = V. temporalis superfic.
 s = Sinus petrosus sup.
 t = V. diploica temporalis post.
 u = V. diploica front.
 v = V. diploica occipitalis
 w = Sinus rectus
 x = Sinus sagittalis inf.

Fig. 20. The large veins of the head and their branches (semischematic). Deep veins and dural sinuses normally obscured by bone are projected on the bony skull.

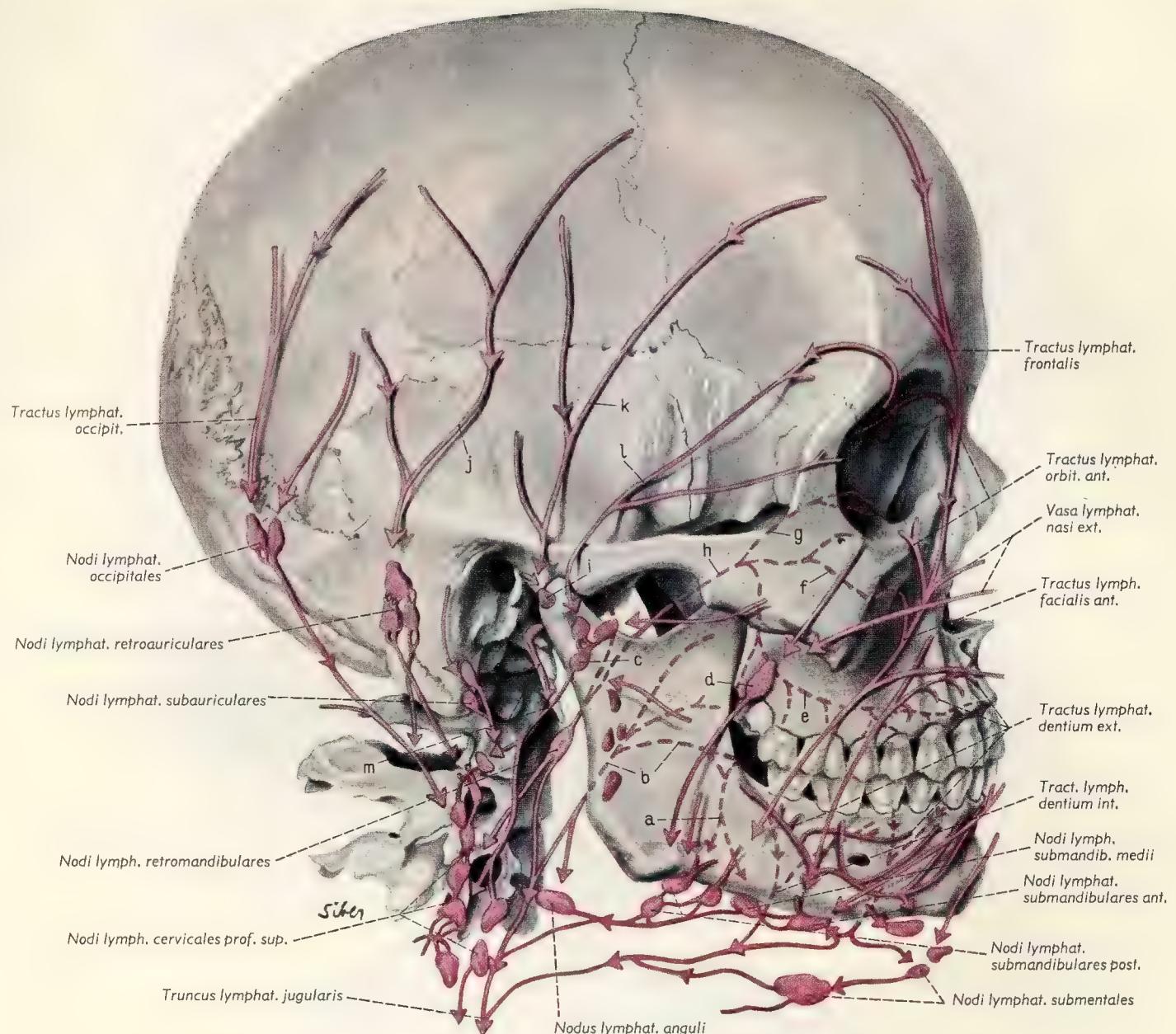


a = N. supraorbitalis
 b = N. nasociliaris,
 N. ethmoidalis ant.
 c = N. lacrimalis
 d = R. zygomaticotemporalis
 e = Rr. nasales post. sup.
 f = Nn. palatini
 g = N. canalis pterygoidei
 h = Nn. masticatorii
 i = N. lingualis, Chorda tympani
 j = N. alveolaris inf.
 k = Rr. temporales et
 zygomatici (VII)
 l, m = Rr. buccales (VII)

n = R. margin mandib. (VII)
 o = R. colli (VII)
 p = N. mylohyoideus
 r = Rr. alveolares sup. post.
 s = N. incisivus (V₂)
 α = Ganglion ciliare
 β = Ganglion pterygopalatinum
 γ = Ganglion oticum
 δ = Ganglion submandib.
 C₁ = N. cervic. I (R. ventr.)
 C₂ = N. cervic. II (R. ventr.)
 C₃ = N. cervic. III (R. ventr.)
 III = N. oculomotorius
 IV = N. trochlearis

V = N. trigeminus,
 Ganglion semilunare
 (trigeminale), Portio motoria
 V₁ = N. ophthalmicus
 V₂ = N. maxillaris
 V₃ = N. mandibularis
 VI = N. abducens
 VII = N. intermedius (XIII),
 Gangl. geniculi
 IX = N. glossopharyngeus,
 Gangl. inferius
 X = N. vagus, Ganglion inferius
 XI = N. accessorius (R. ext.)
 XII = N. hypoglossus

Fig. 21. The nerves of the head (semischematic).



a = Inferior, anterior efferent lymph vessels from palatine tonsil
 b = Posterior, superior drainage (of tonsils)
 c = Parotid lymph nodes
 d = Buccal lymph node
 e = Deep drainage from teeth of upper jaw
 f = Lymph vessels along infraorbital a.

g = Posterior orbital drainage
 h = Lymph vessels along maxillary a.
 i = Preauricular lymph nodes
 j = Retroauricular lymph tract
 k = Middle temporal lymph channel along the superfic. temporal a.
 l = Anterior temporal lymph channel along the zygomaticoorbital a.
 m = Posterior facial lymph tract

Fig. 22. Lymph channels of the head and associated lymph nodes (schematic). Deep vessels are indicated by broken lines. Lymph vessels of the tongue, pharynx and so forth are not included.

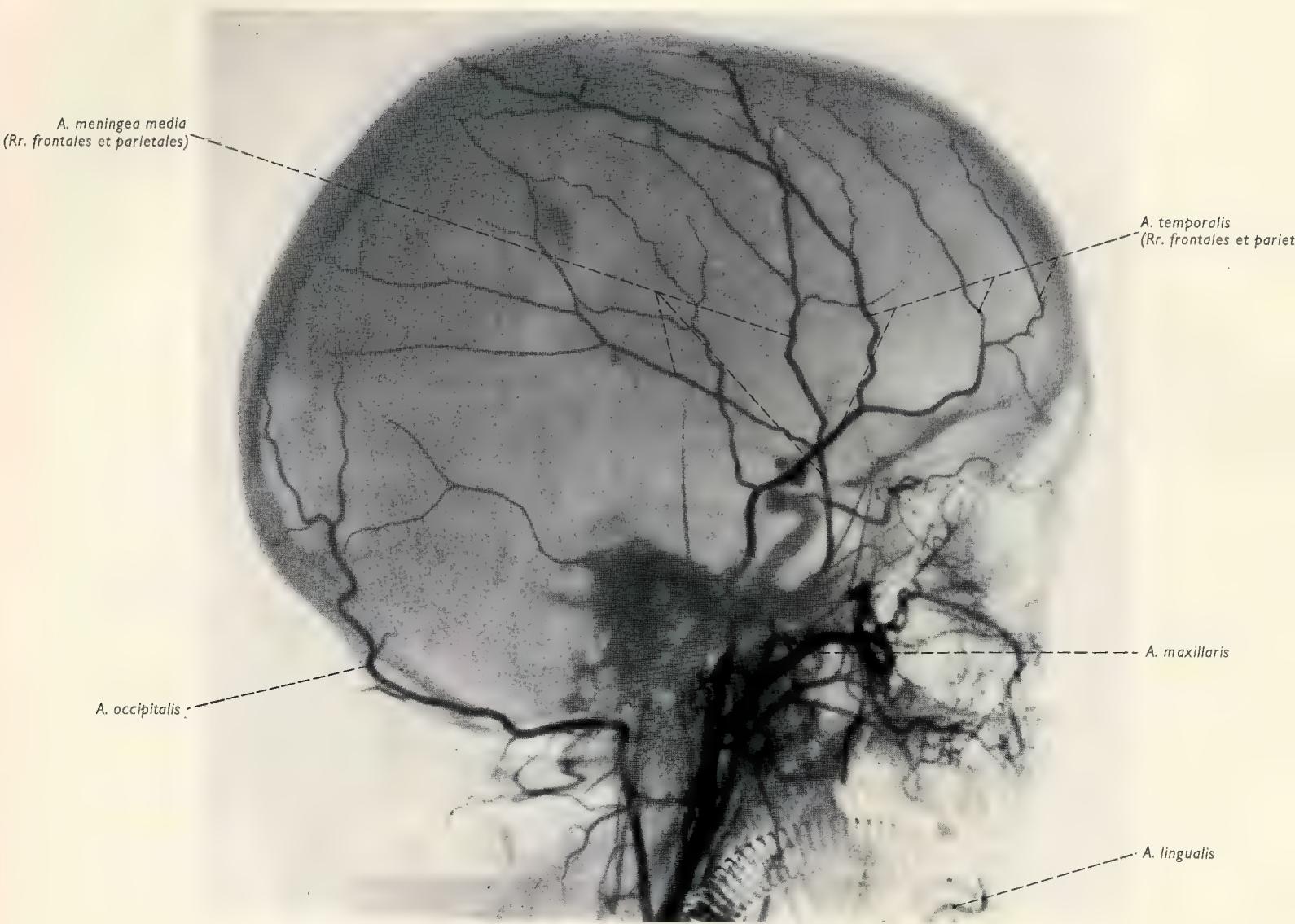
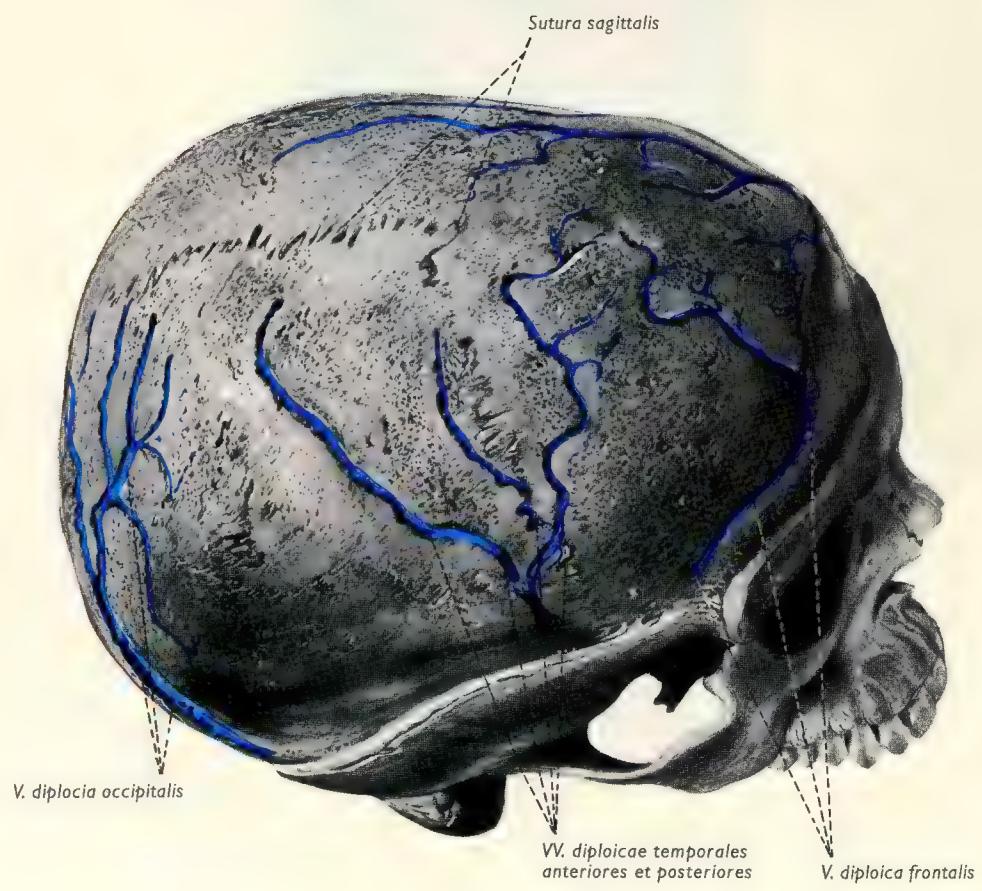


Fig. 23. Arteriogram of external carotid artery and its branches to the skull.

Fig. 24. (Right, top) Lateral roentgenogram of diploic veins.

Fig. 25. (Right, bottom) Diploic veins of the skullcap prepared by removing the outer table of the calvaria (from Sobotta/Becher).



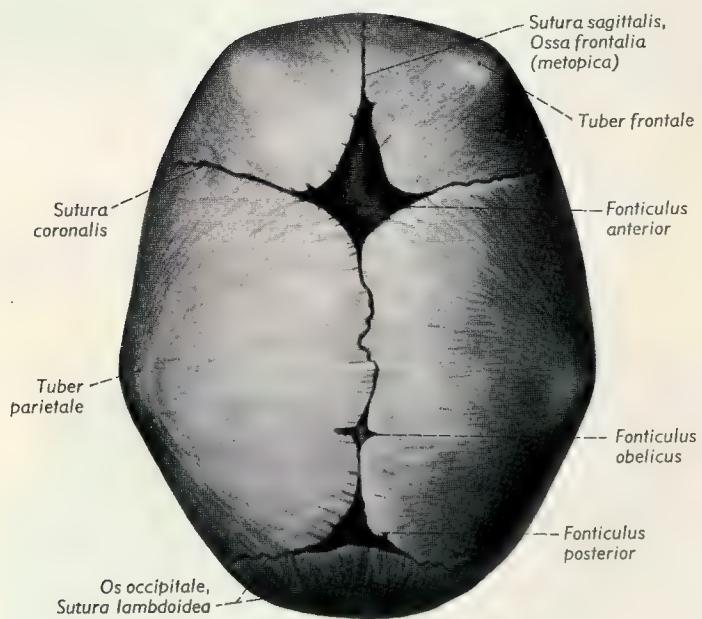
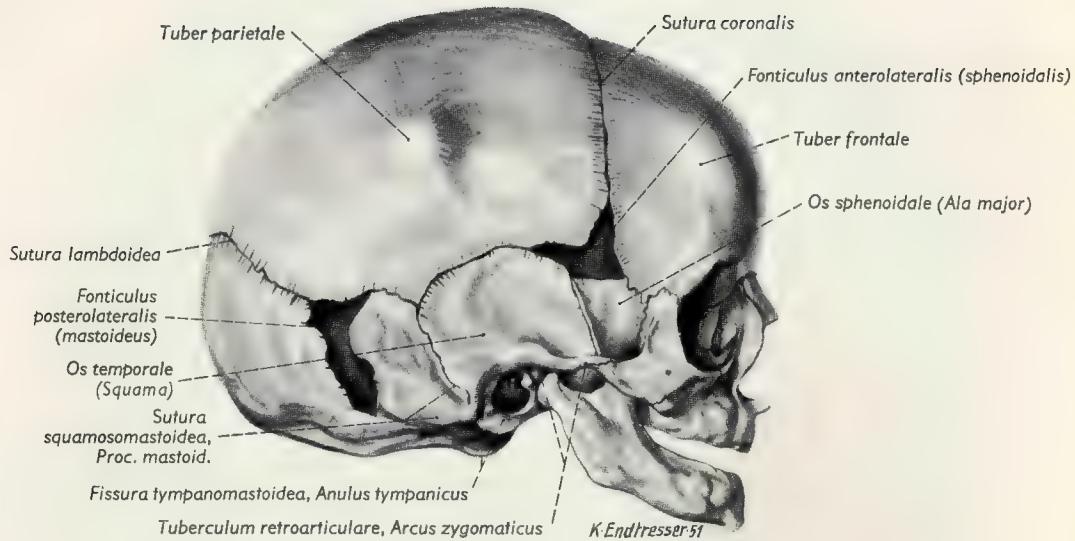


Fig. 26. (Top) Skull of a newborn seen from the right.

Fig. 27. (Bottom) Skull of a newborn seen from above.

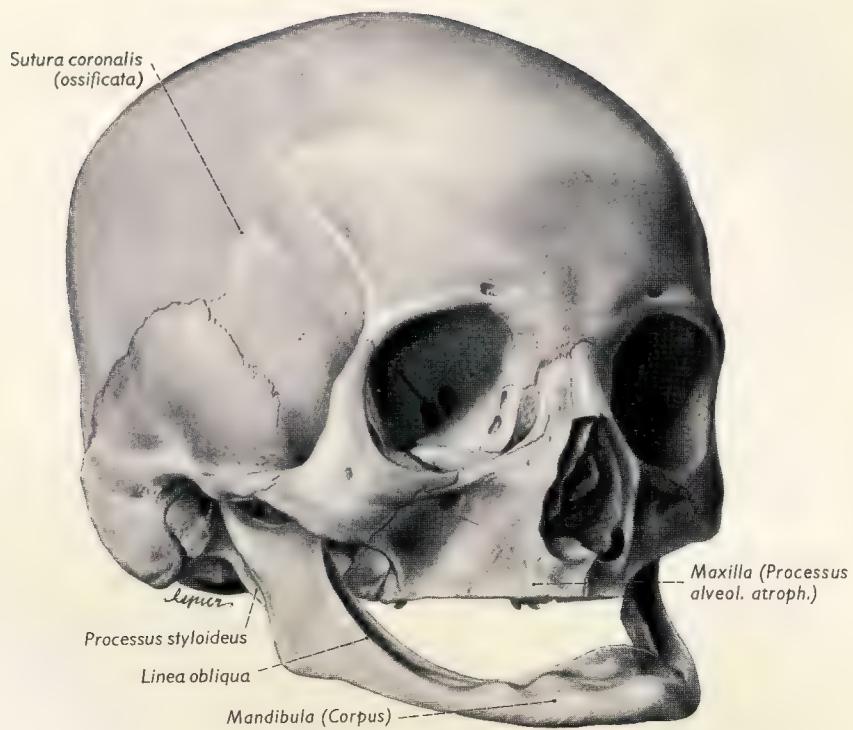


Fig. 28. Skull of an aged edentulous individual (one half normal size).

Brain and Meninges

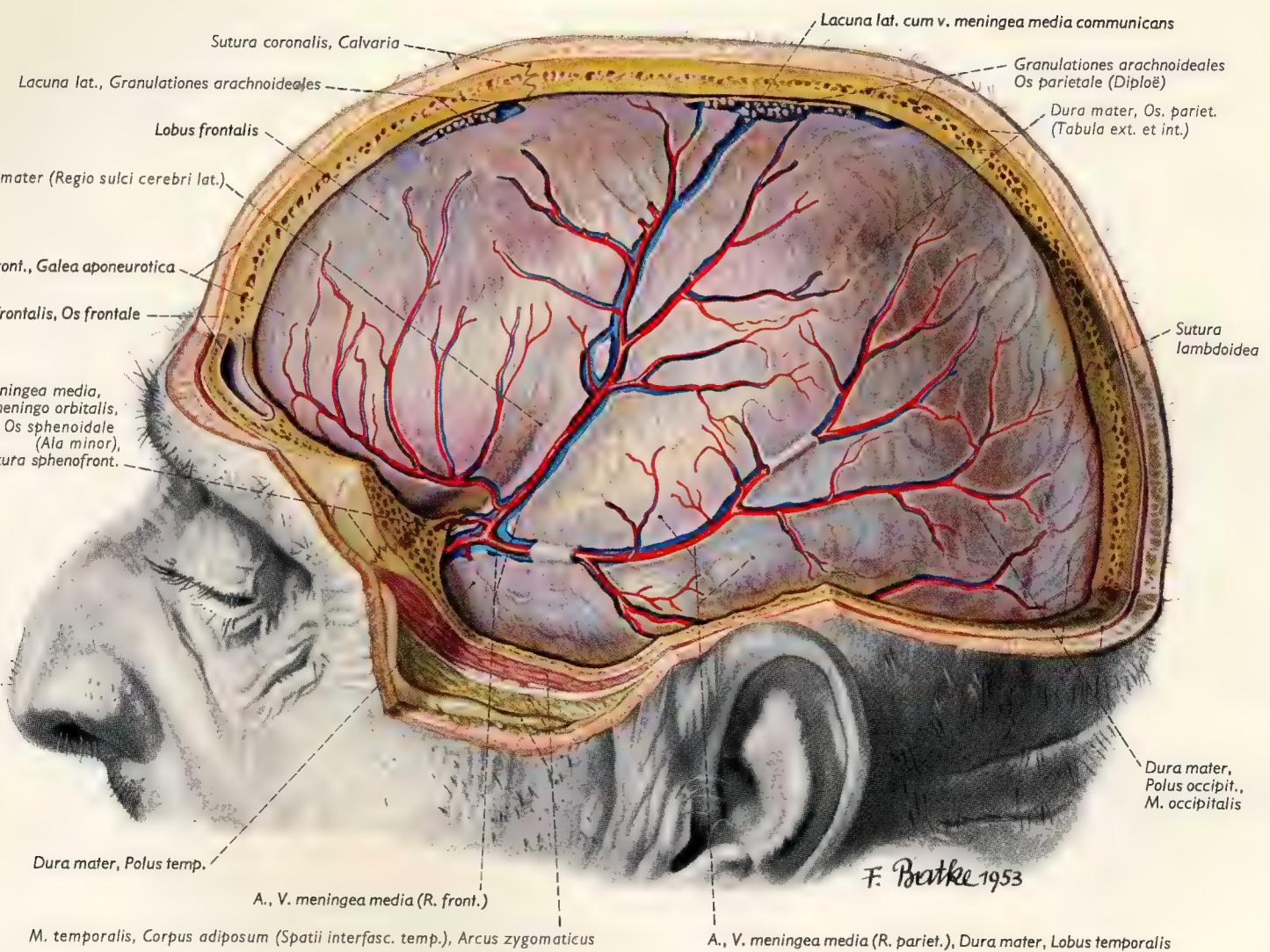


Fig. 29. Lateral exposure of the dural covering of the brain with the middle meningeal artery and veins.

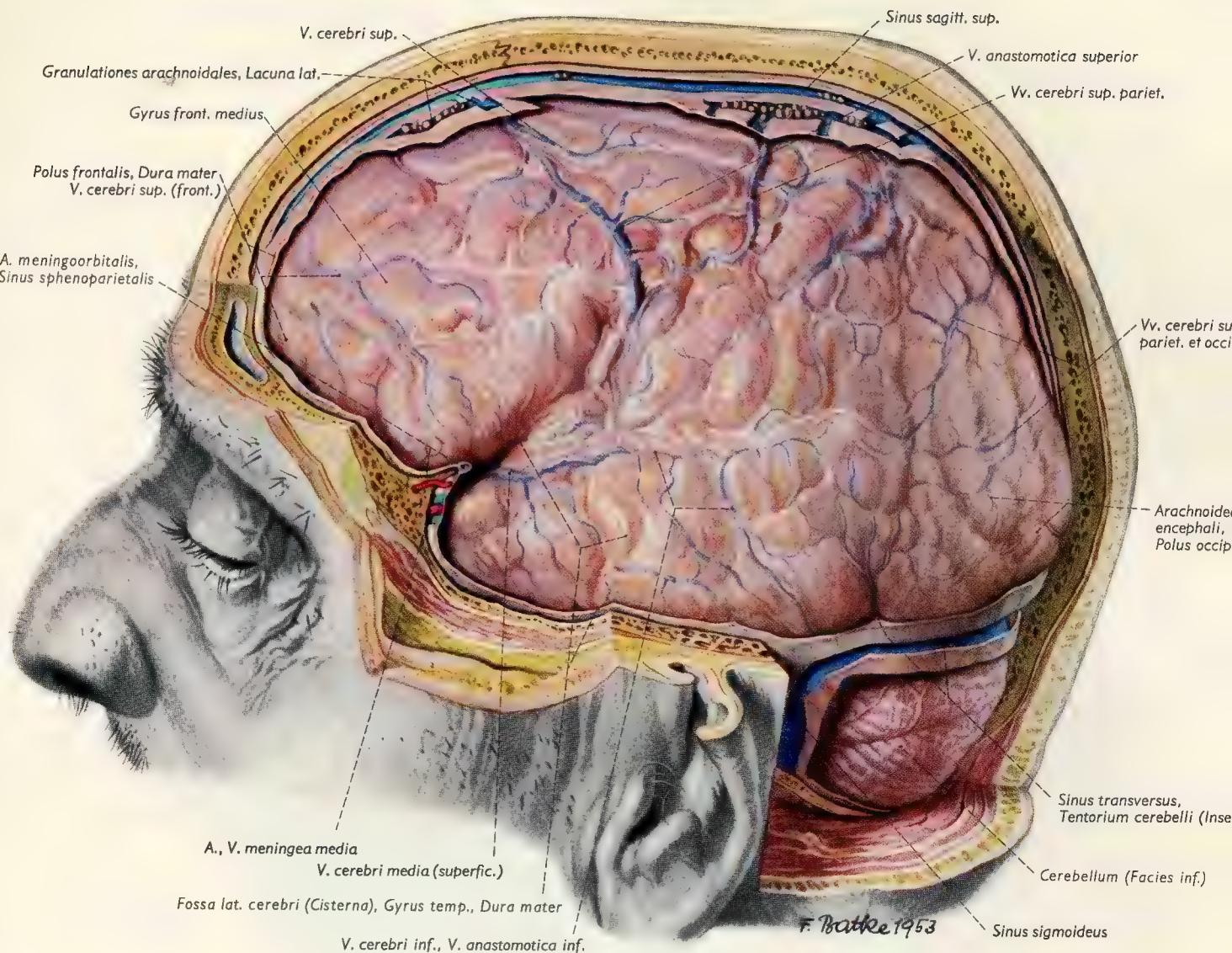


Fig. 30. Left cerebral hemisphere and cerebellum, *in situ*, covered by the arachnoid layer.

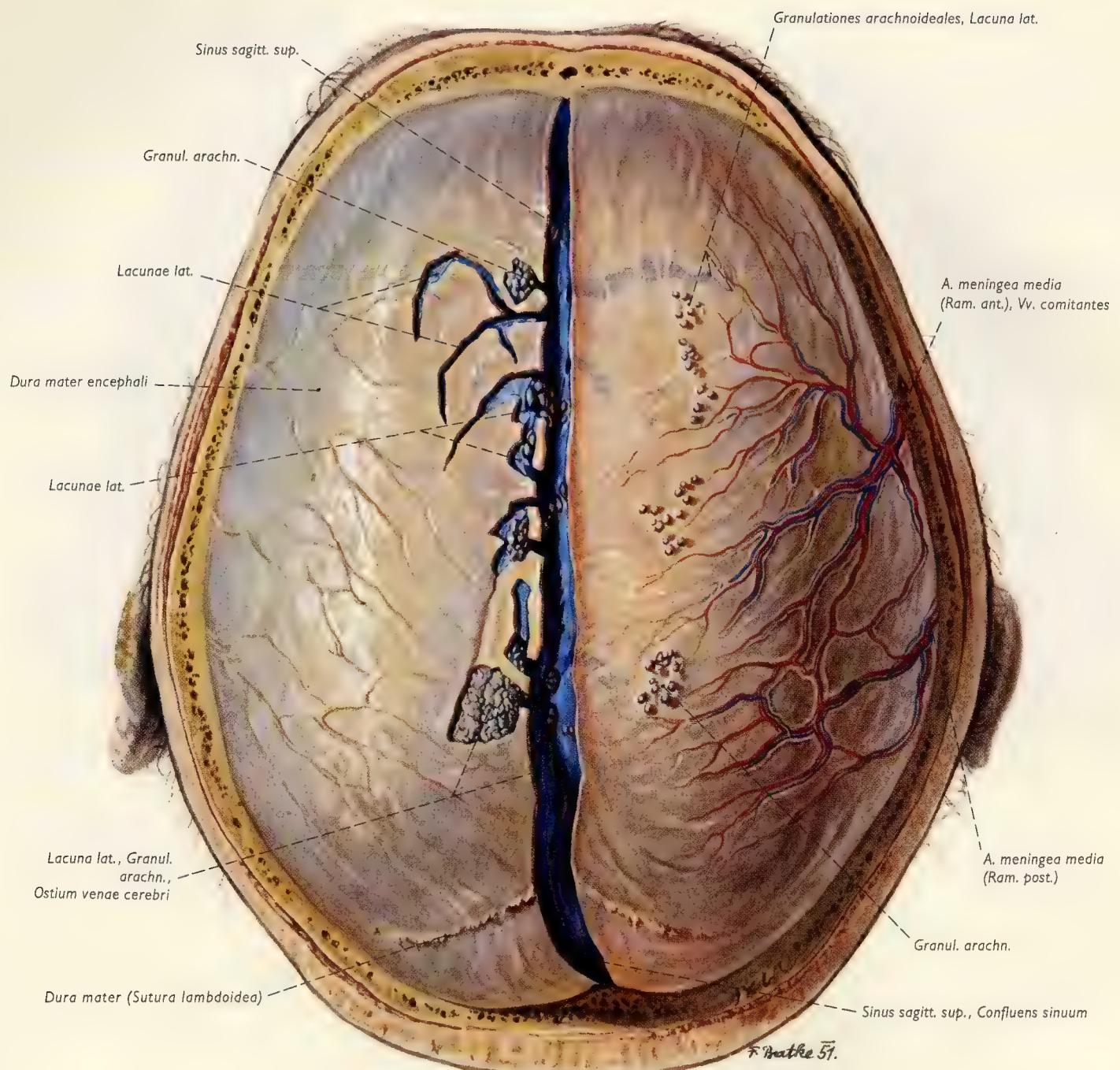
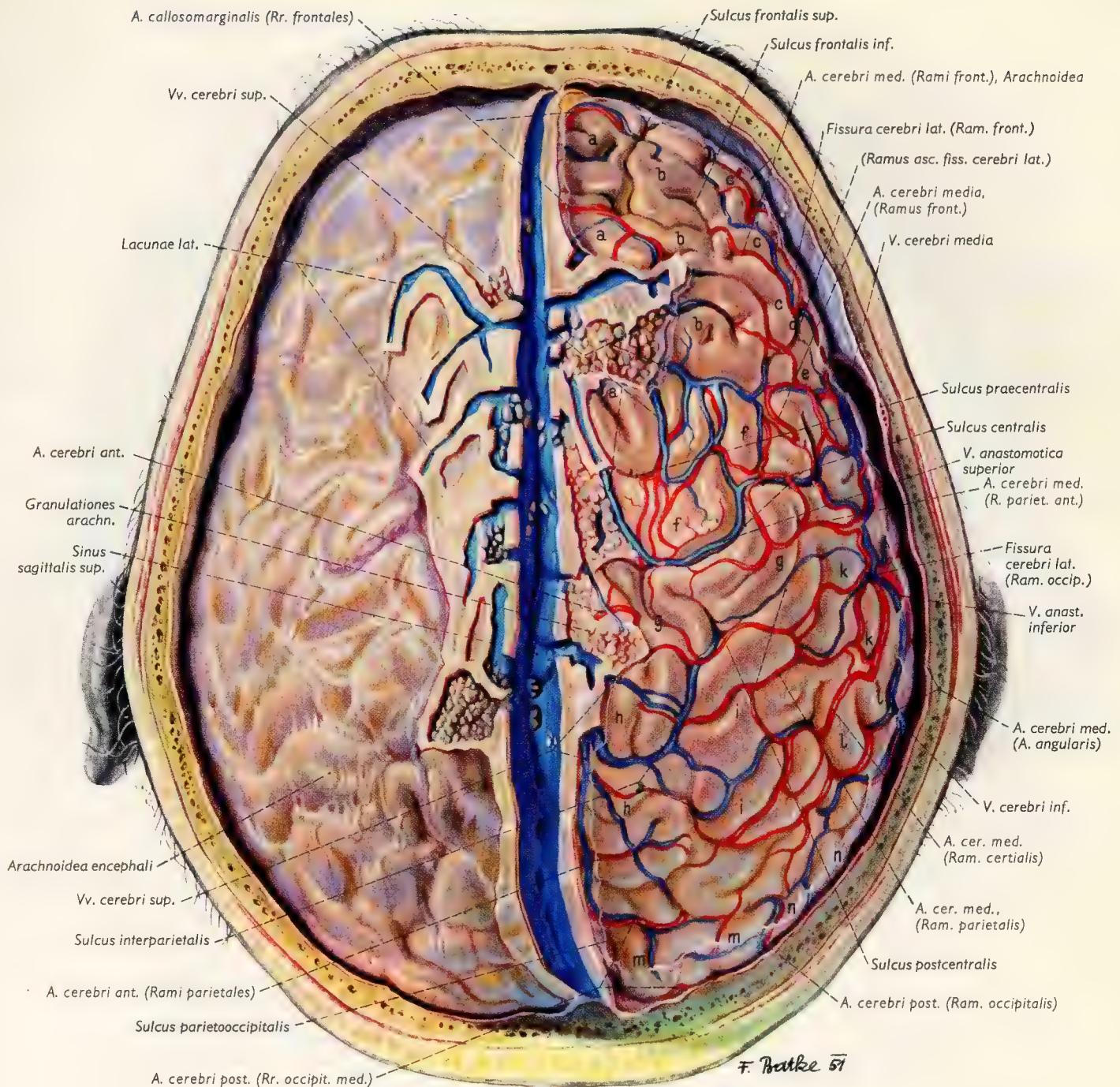


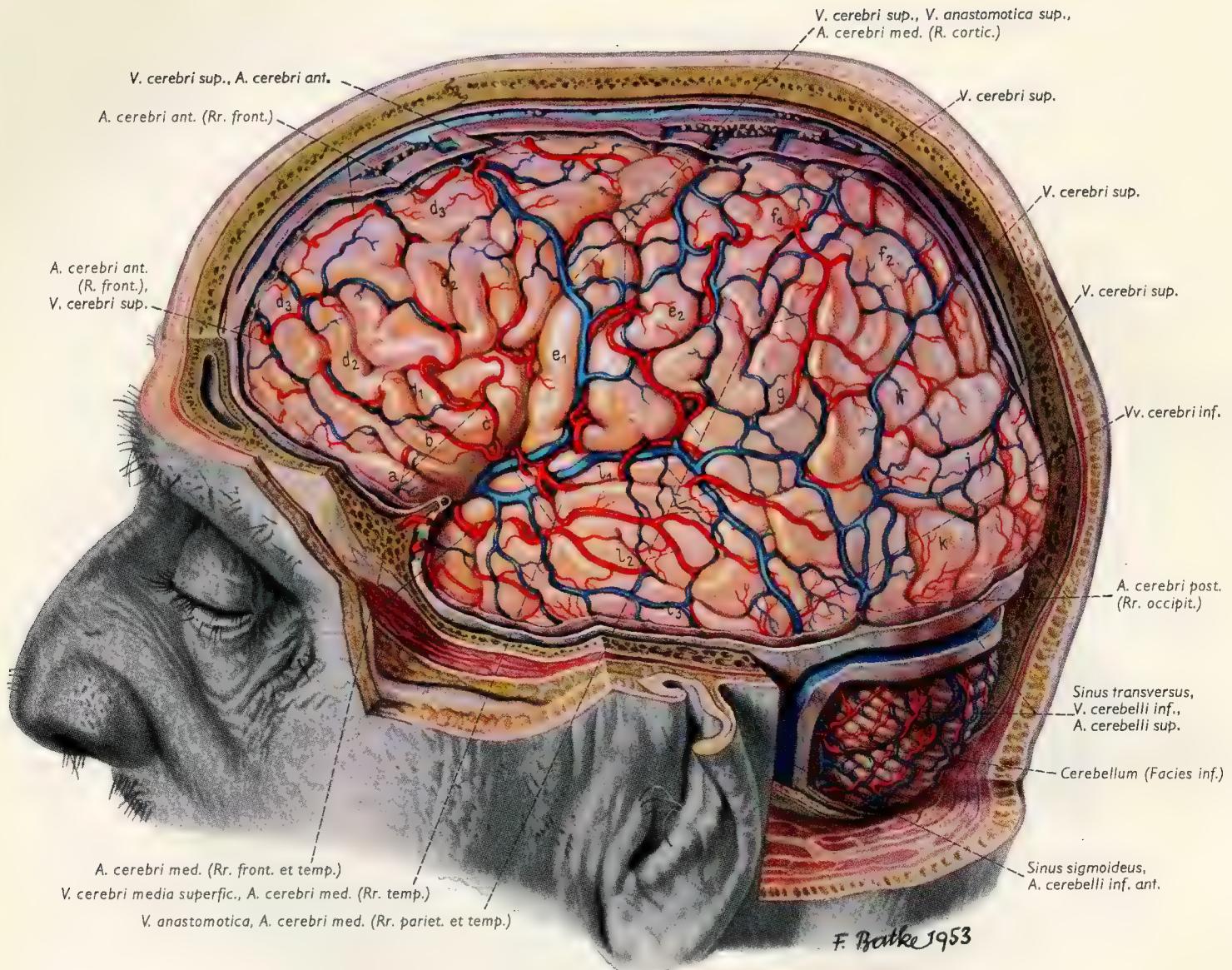
Fig. 31. Surface of dura mater from above after removal of the skullcap by means of a circular saw cut. Superior sagittal sinus and lateral lacunae are opened.



a = Gyrus frontalis sup.
 b = Gyrus frontalis med.
 c = Gyrus frontalis inf.
 d = Pars triangularis
 e = Pars opercularis } Gyrus frontalis inf.
 f = Gyrus praecentralis

g = Gyrus postcentralis
 h = Lobulus pariet. sup.
 i = Lobulus pariet. inf.
 k = Gyrus supramarginalis
 l = Gyrus angularis
 m = Gyri occipitales sup.
 n = Gyri occipitales lat.

Fig. 32. Exposure of the brain from above. The arachnoid has been removed from the right hemisphere to demonstrate blood vessels; the arachnoid is intact on the left side.



a = Gyrus front. inf.,
Pars orbit.
b = Gyrus front. inf.,
Pars triangularis
c = Gyrus front. inf.,
Pars opercularis

d₁ = Gyrus front. inf.
d₂ = Gyrus front. med.
d₃ = Gyrus front. sup.
e₁ = Gyrus praecentralis
e₂ = Gyrus postcentralis
f₁, f₂ = Lobulus pariet. sup.

g = Gyrus supramarginalis
h = Gyrus angularis
j, k = Gyri occipitales
l₁ = Gyrus temporalis sup.
l₂ = Gyrus temporalis med.
l₃ = Gyrus temporalis inf.

Fig. 33. Lateral exposure of the brain. In the exposed area the arachnoid has been removed completely so that the left hemispheres of the cerebrum and cerebellum and their blood vessels may be seen.

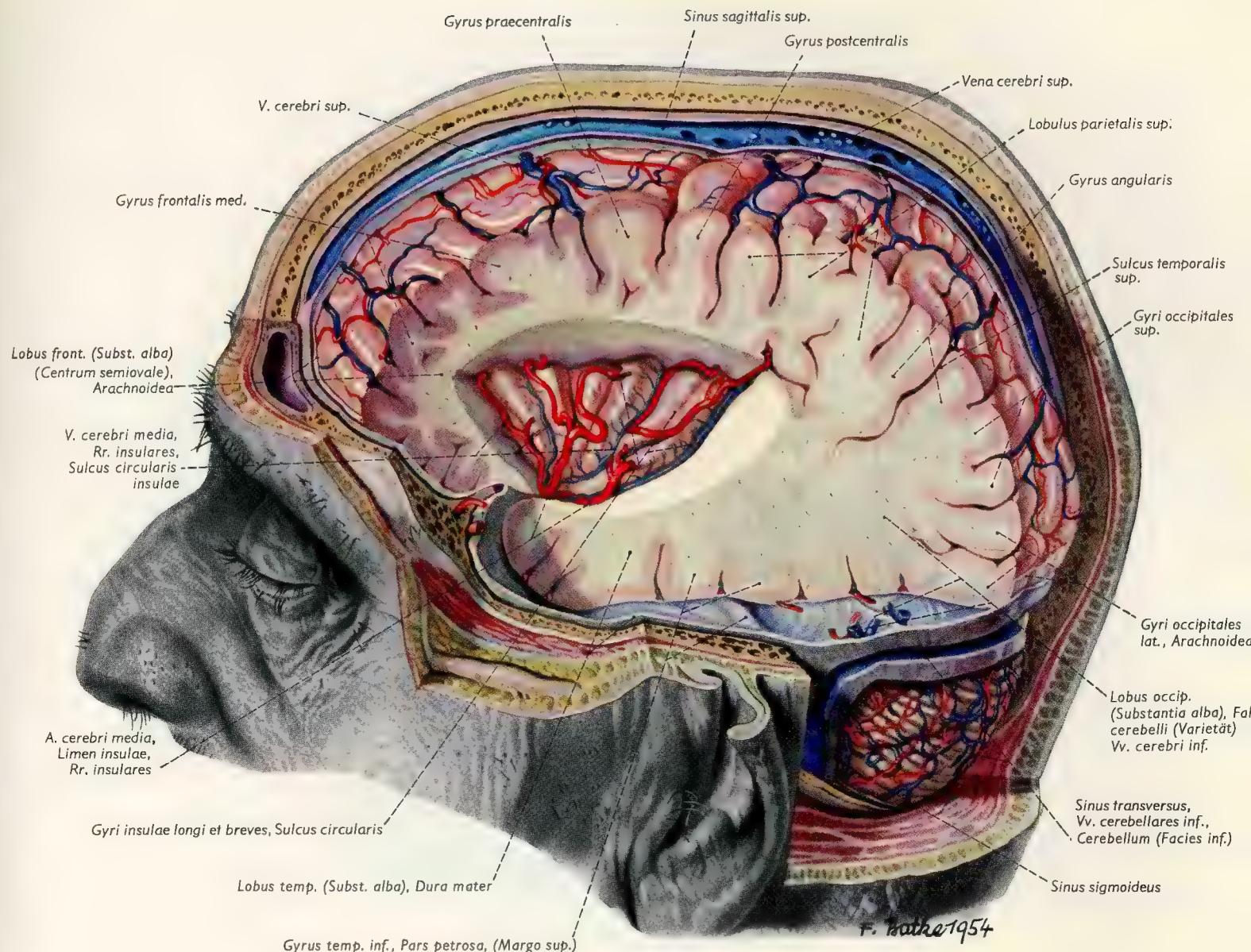
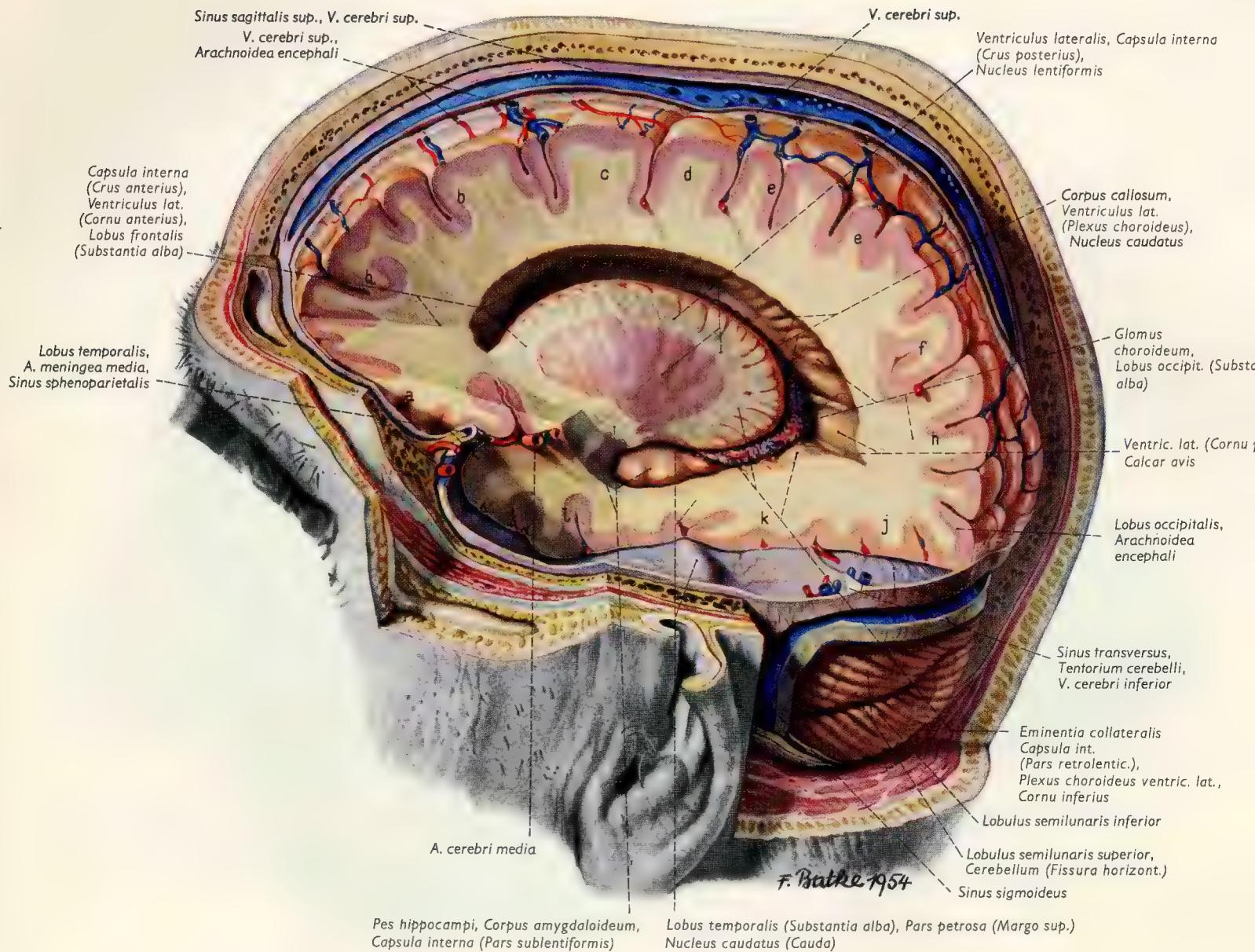
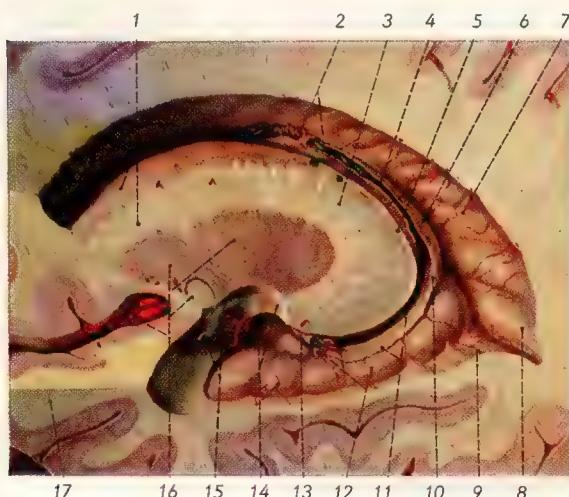


Fig. 34. Exposure of the insula by parasagittal section and removal of the opercula.



Key for Fig. 36

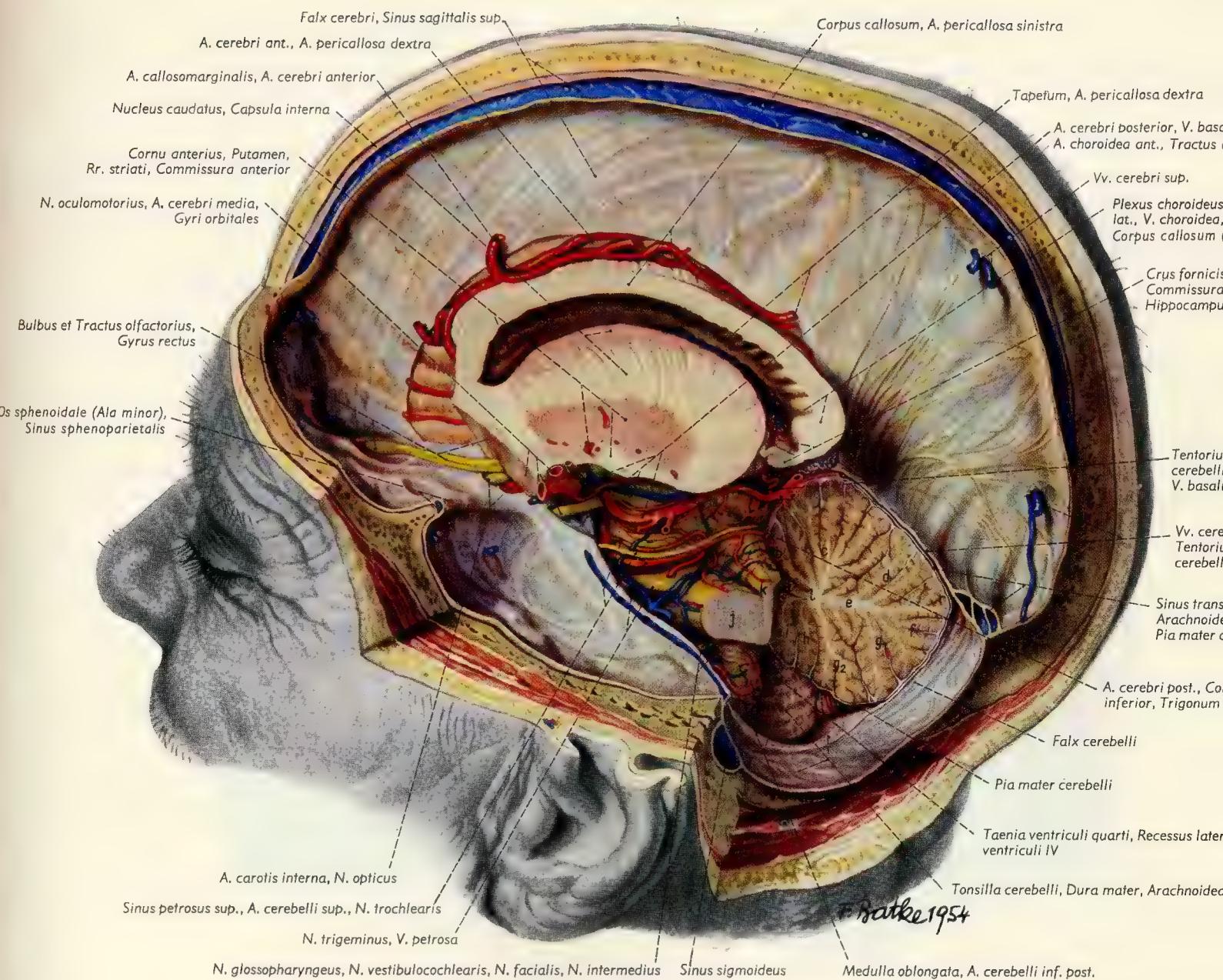
- 1 = Capsula int. (Crus ant.), Caput nuclei caudati, Ventric. lat. (Cornu ant.)
- 2 = Plexus choroideus ventric. lat., V. choroidea
- 3 = Capsula int. (Crus post.), V. thalamostriata (= V. fronto-parietalis int.)
- 4 = Taenia fornicis, Taenia choroidea
- 5 = Stria terminalis, Lamina affixa
- 6 = Crus fornicis
- 7 = Tapetum
- 8 = Calcar avis
- 9 = Trigonum et Eminentia collateralis



- 10 = Taenia fornicis
- 11 = Fissura choroidea, Fimbria hippocampi
- 12 = Pes hippocampi, Plexus choroideus, A. choroidea ant.
- 13 = Velum Aebianum
- 14 = Cauda nuclei caudati Hippocampus cum diagationitonus
- 15 = Corpus amygdaloideum, Capsula interna (Pars subtentiformis)
- 16 = Nucleus lentiformis, Commissura ant., A. cerebri media
- 17 = Polus lobi temporalis

Fig. 35. (Top) Lateral exposure of the brain. The lateral ventricle has been opened.

Fig. 36. (Bottom) Left lateral ventricle, basal ganglia and internal capsule.



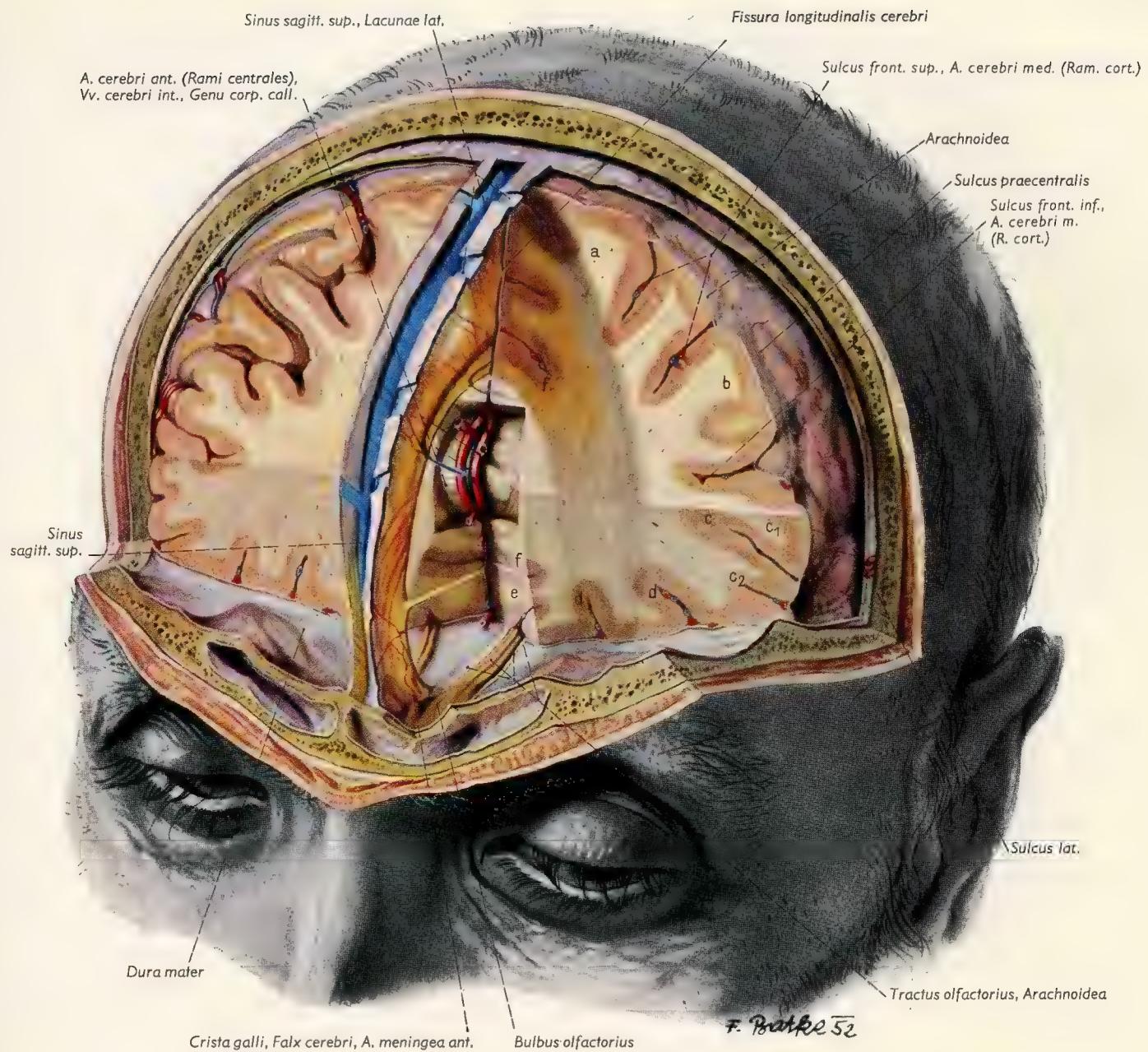
a = Lingula cerebelli, Velum medullare ant.	e = Arbor vitae cerebelli	i = Nodulus
b = Ala lobuli centralis	f = Folium vermis	j = Pedunculus cerebellaris medius, Pedunculus cerebellaris inf.
c = Culmen	g ₁ = Tuber vermis	k = Pedunculus cerebellaris superior
d = Declive	g ₂ = Pyramis vermis	l = Fastigium
	h = Uvula	

Fig. 37. Lateral exposure of the brain. The left hemisphere is almost completely removed.



a = Gyrus frontalis sup.
 b = Gyrus frontalis med.
 c = Gyrus frontalis inf.

Fig. 38. View of telencephalon from the front. Skullcap has been removed back to the coronal suture.



a = Gyrus frontalis sup.
 b = Gyrus frontalis med.
 c = Gyrus frontalis inf.

c₁ = Pars triangularis of Gyrus
 front. inf.
 c₂ = Pars orbitalis of Gyrus
 front. inf.

d = Gyri orbitales
 e = Gyrus rectus
 f = Gyrus cinguli

Fig. 39. View of the olfactory bulb and tract and the genu of corpus callosum. Parts of both frontal lobes have been removed, leaving falx cerebri intact.

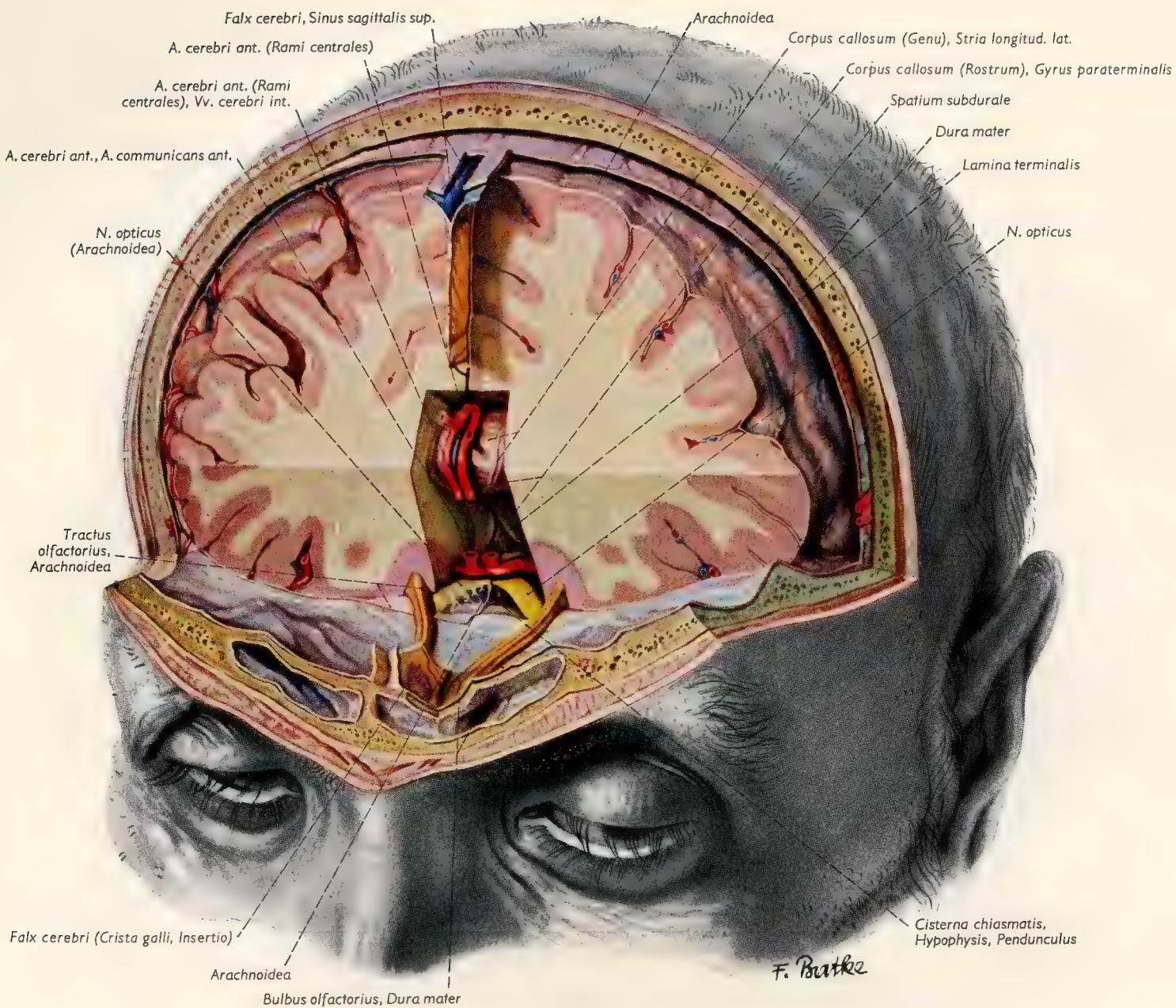


Fig. 40. View of brain from the front. By further removal of portions of the frontal lobes and falk cerebri, the region of sella turcica with vessels and nerves is exposed. Note the relationship of the anterior cerebral arteries to the optic nerve.

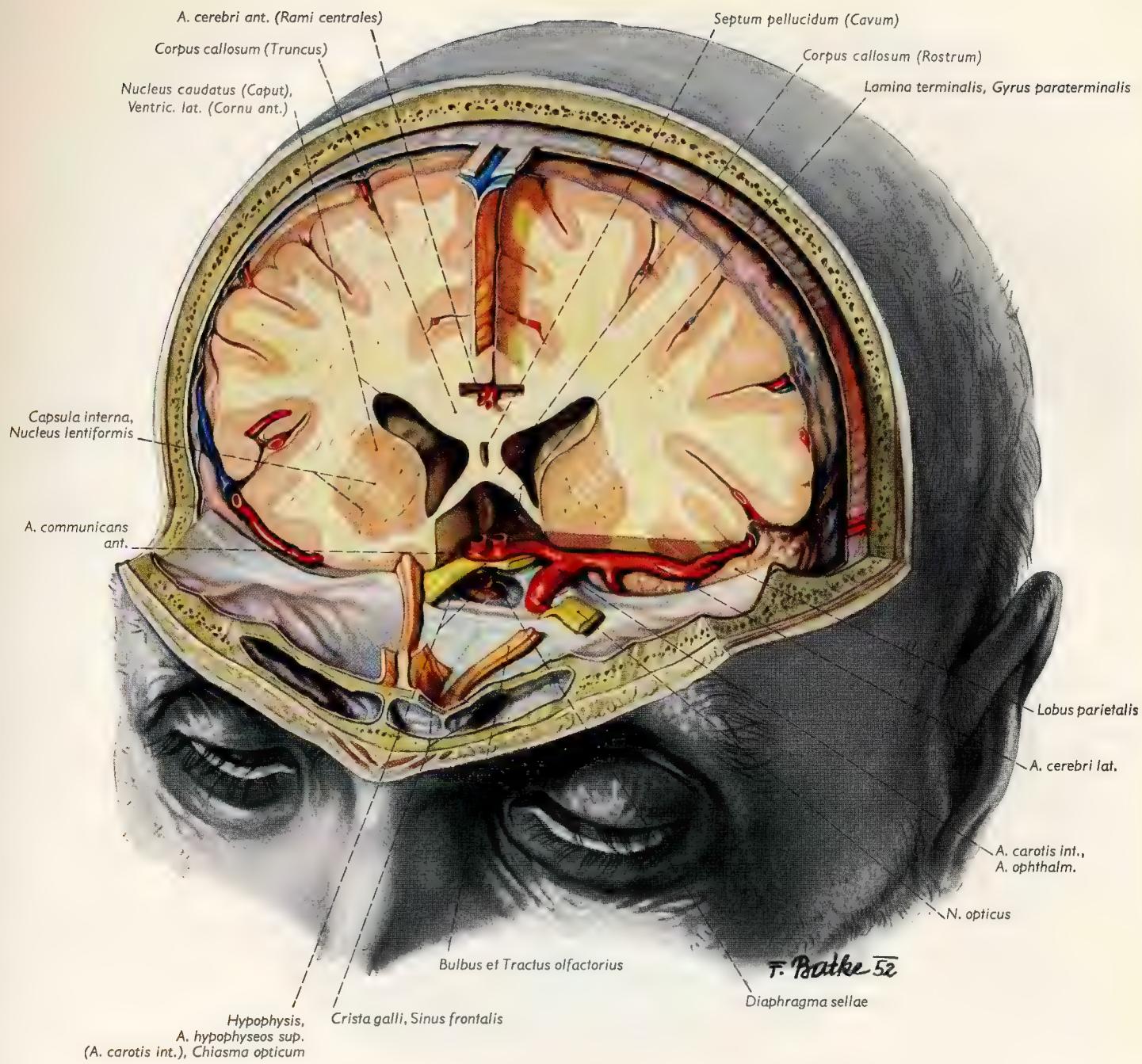
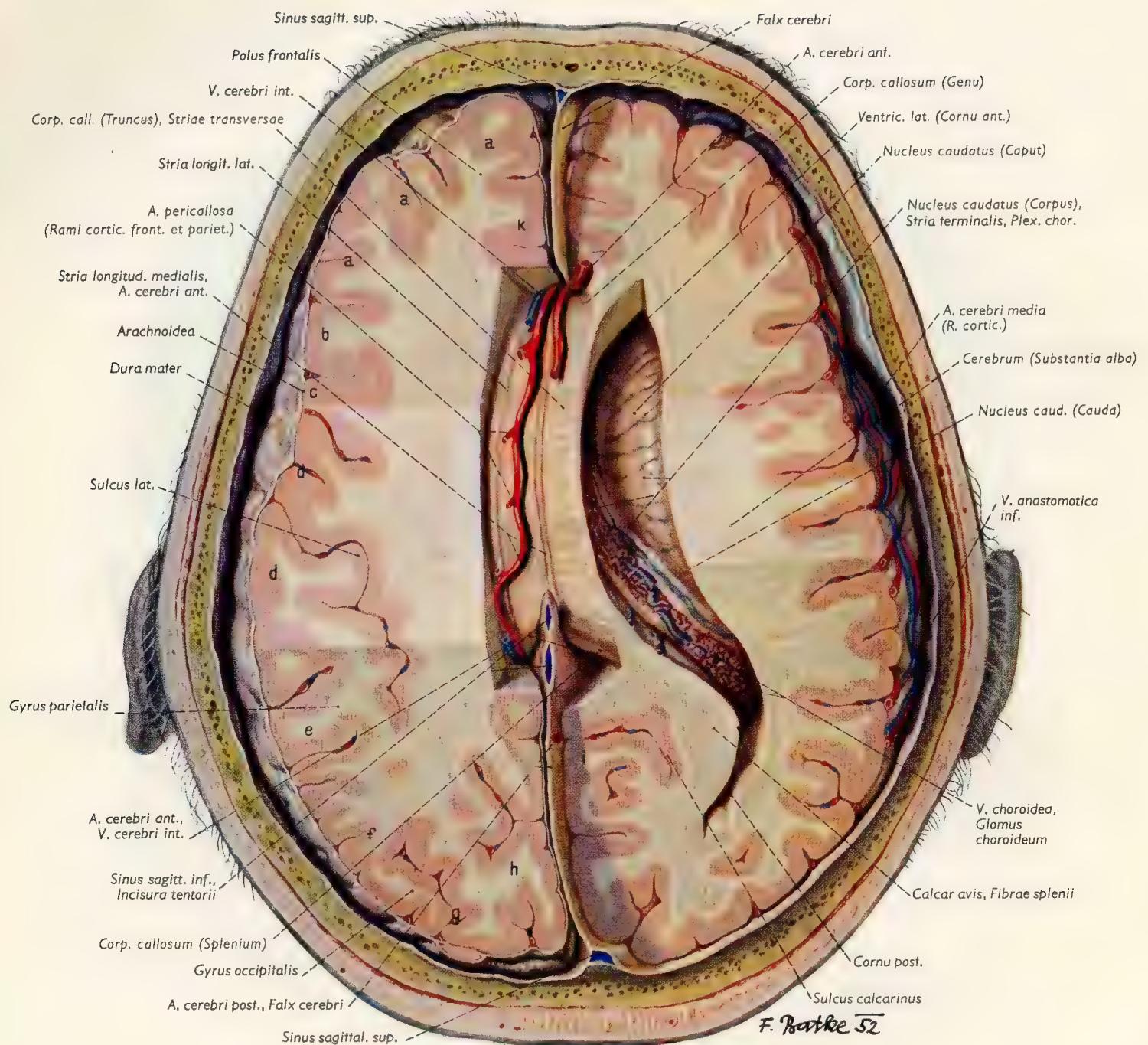


Fig. 41. Arteries and nerves of the suprasellar hypophyseal region; branching internal carotid artery. The upper surface of the hypophysis and the infundibulum are visible. Frontal section of the hemispheres at the level of the optic chiasm.



a = Gyrus frontalis sup.
 b = Gyrus praecentralis
 c = Gyrus postcentralis
 d = Gyrus supramarginalis

e = Gyrus angularis
 f = Gyri occipitales lat.
 g = Gyri occipitales sup.

h = Cuneus
 i = Isthmus gyri fornicati (G. cinguli)
 k = Gyrus cinguli

Fig. 42. The top part of telencephalon has been removed by a horizontal section above corpus callosum. The right lateral ventricle (anterior horn, central part, posterior horn) is opened.

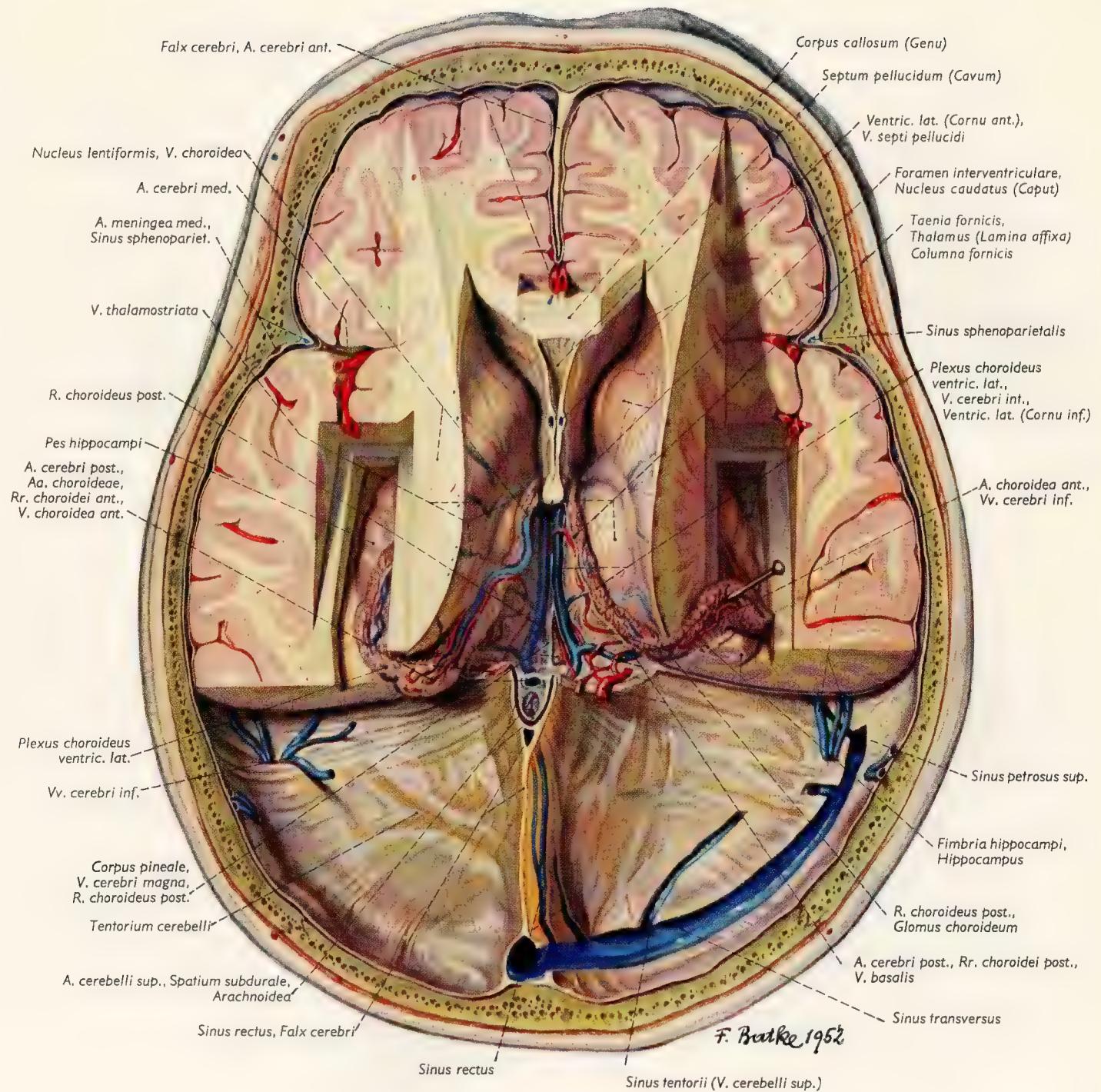


Fig. 43. View of brain from above. Demonstration of tela choroidea of the forebrain; the veins of the tela are shown on the right. The entire choroid plexus of the lateral ventricles has been preserved on both sides. The right half of the pineal gland is seen in its leptomeningeal bed. The right transverse sinus has been opened in the region of the tentorium.

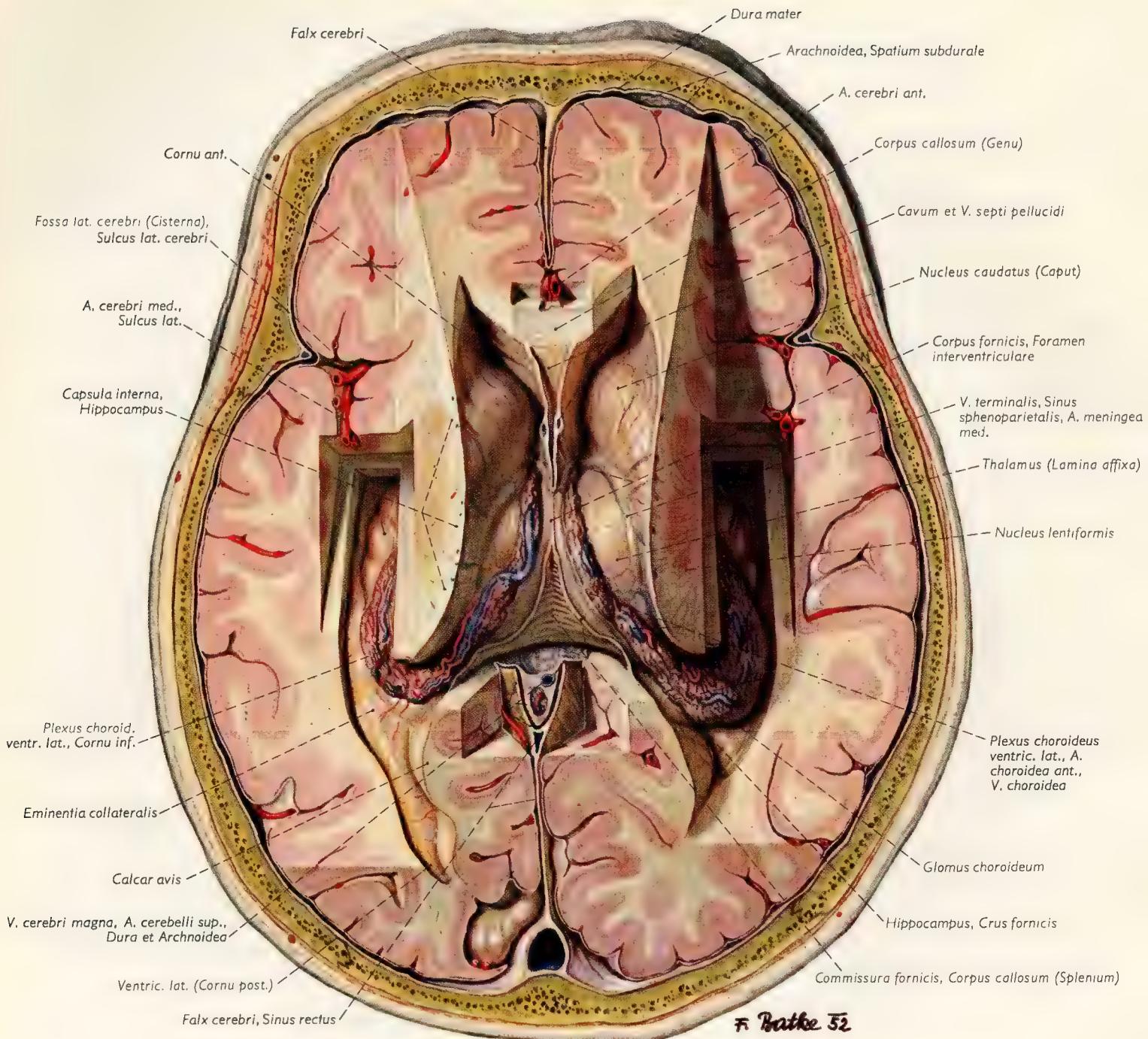


Fig. 44. View of the brain from above. Corpus callosum has been removed by a series of frontal and sagittal sections so that the body of fornix and the hippocampal commissure are brought into view in the center; on the sides, the inferior horn and the choroid plexus of the lateral ventricle may be seen. Septum pellucidum has been cut horizontally so as to open cavum septi pellucidi.

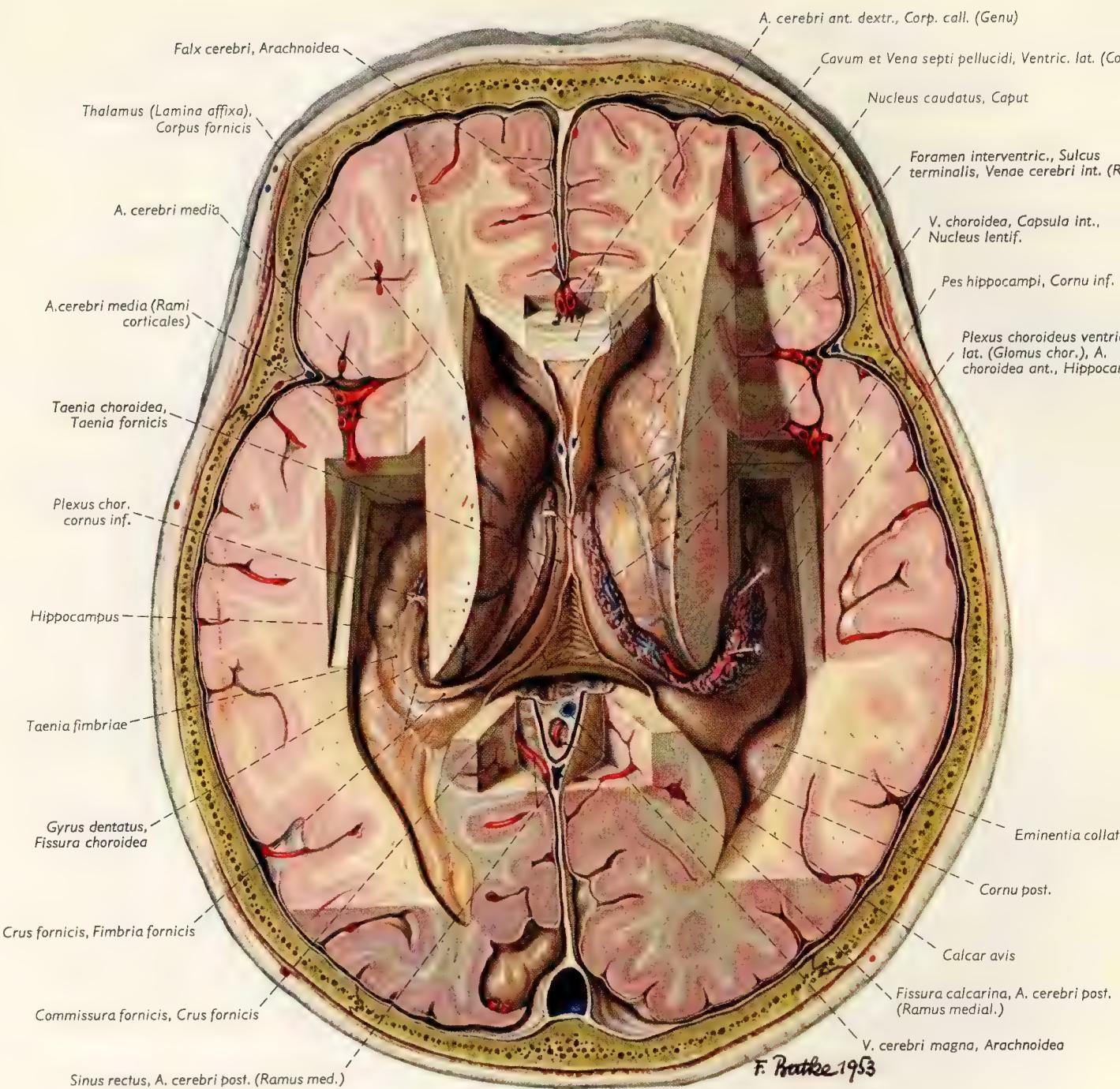


Fig. 45. Horizontal section through brain and skull above the thalamus. Demonstration of the cavities of the lateral ventricles.

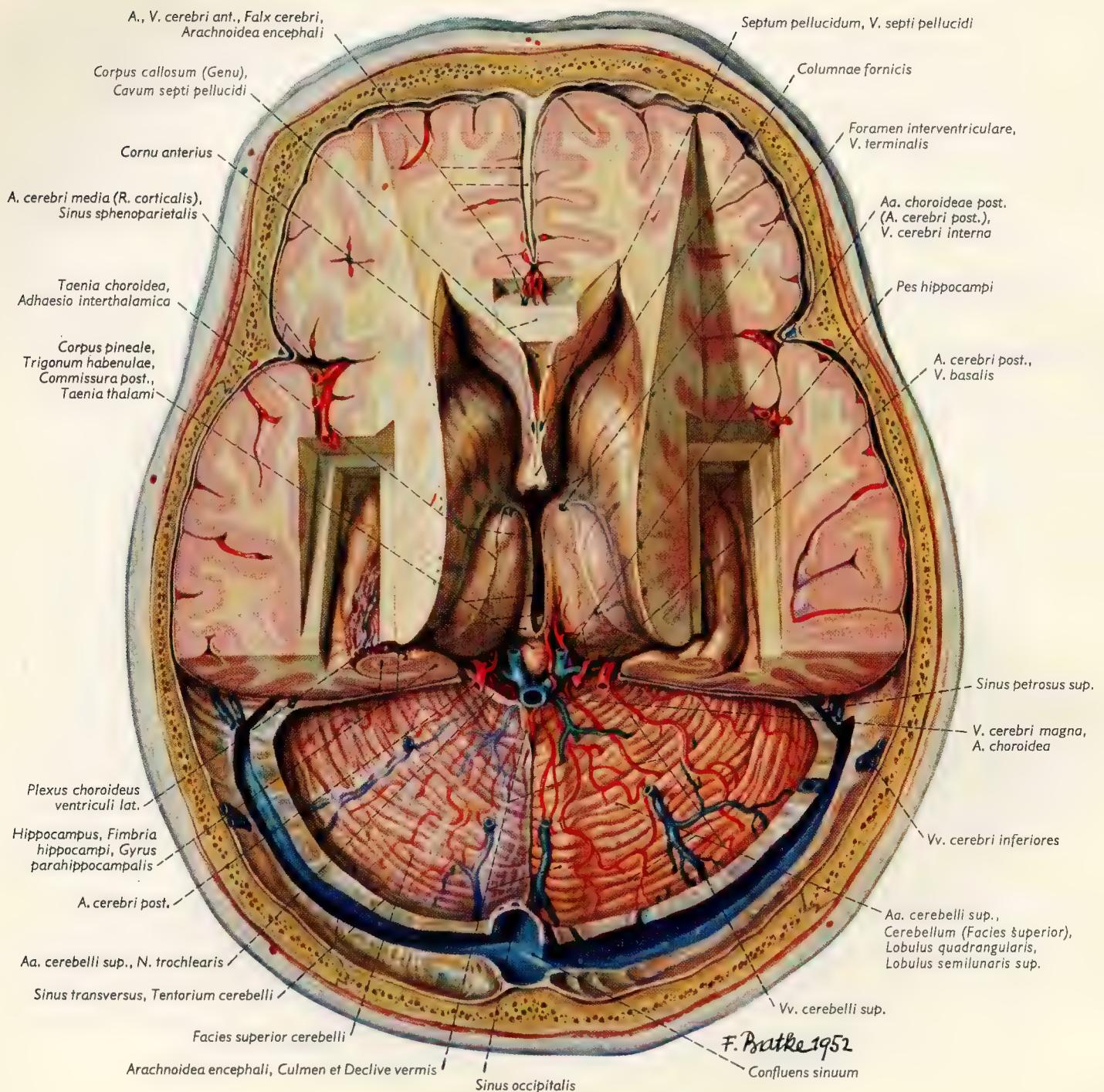


Fig. 46. The brain viewed from above. The tentorium has been removed bilaterally posterior to a frontal section through the occipital lobe, preserving the transverse sinus. On the left side, the arachnoid over cerebellum is intact; on the right, it has been removed so that blood vessels on the upper surface of cerebellum may be seen.

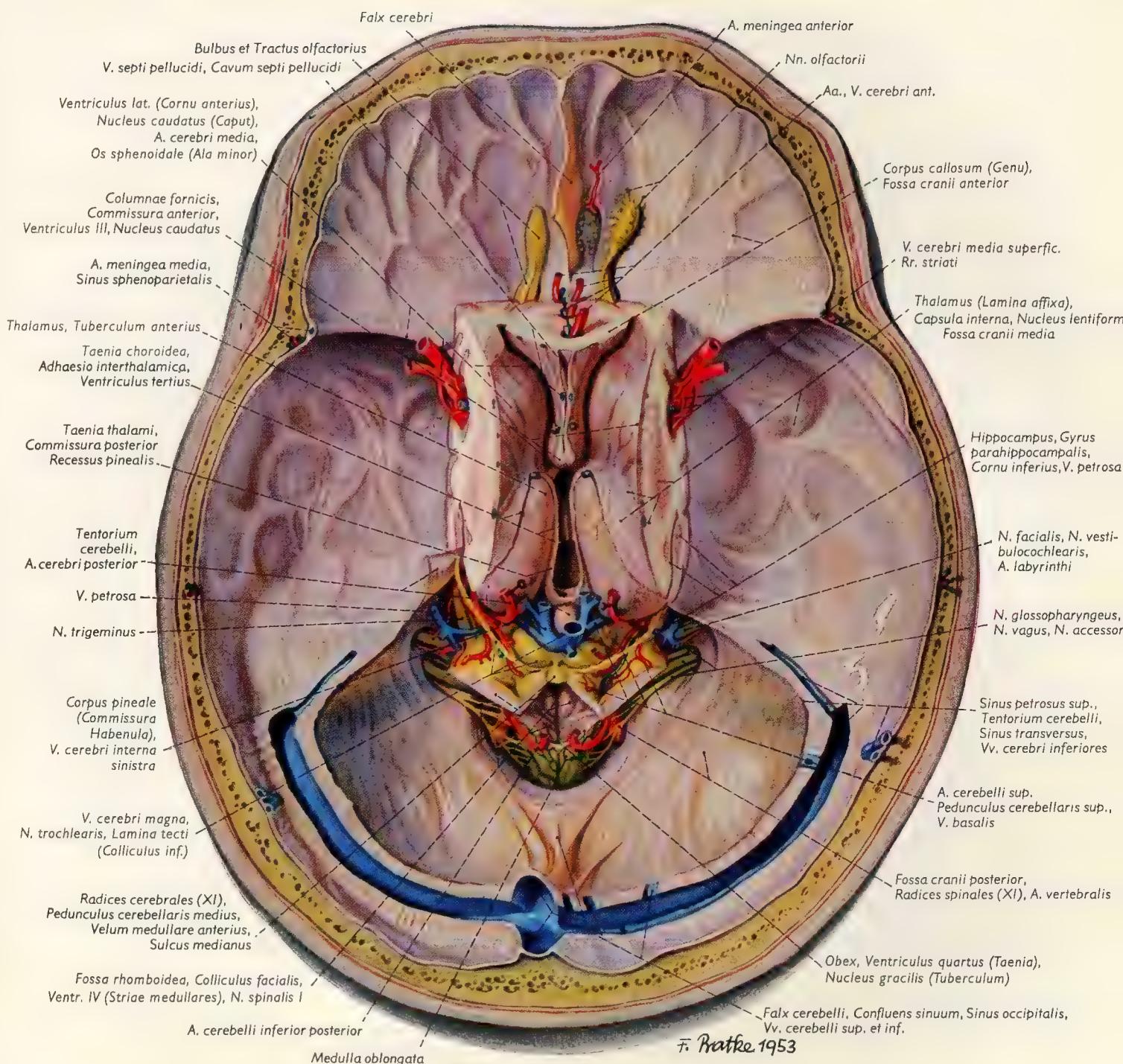
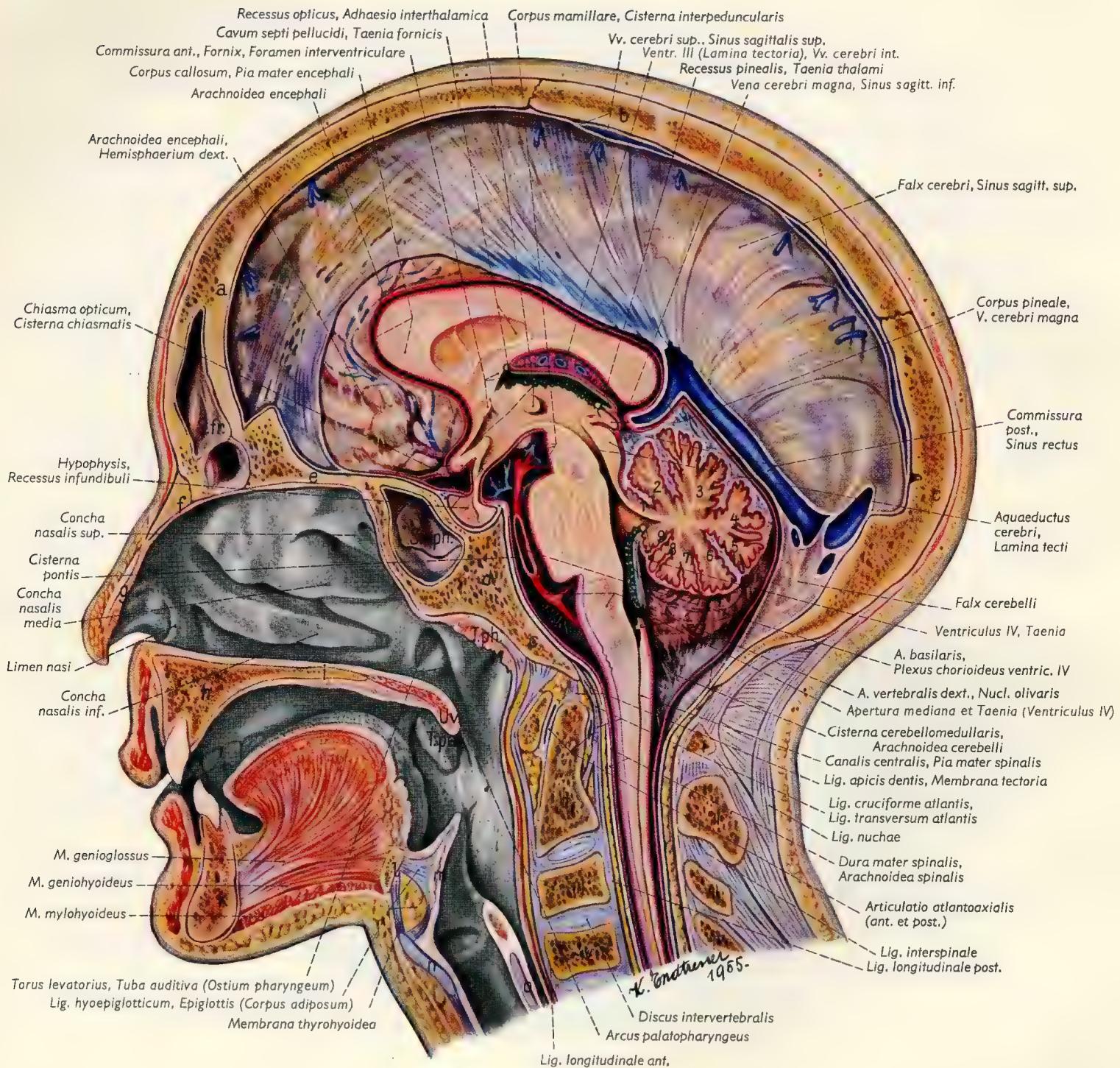


Fig. 47. The brain stem (truncus cerebri) in situ. Intracranial course of cranial nerves. Relationships of the brain stem to the cranial fossae.



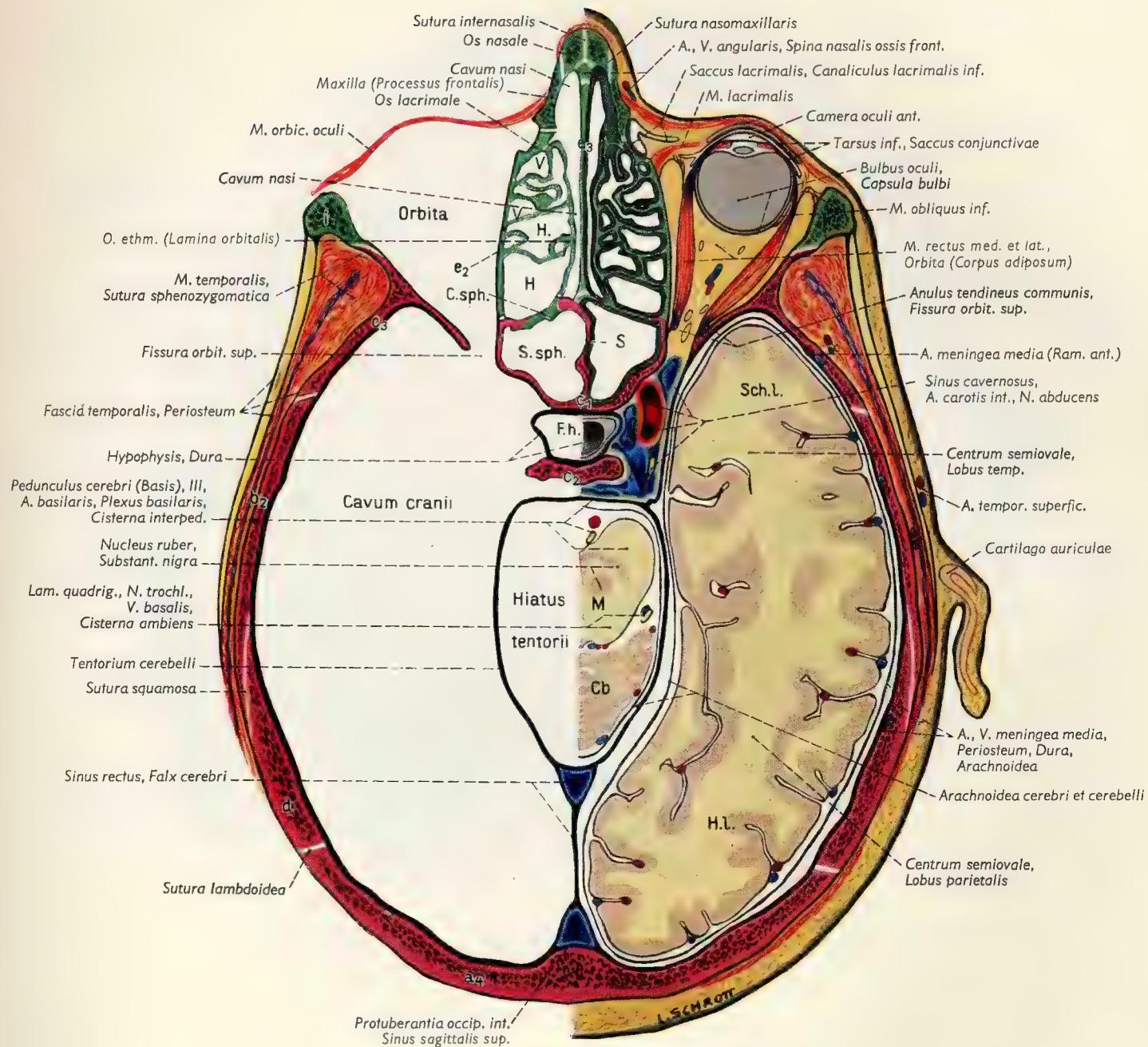
a = Os frontale
 b = Os parietale
 c = Os occipitale
 d = Os sphenoidale
 e = Os ethmoidale
 f = Os nasale
 g = Cartilago nasi lateralis

h = Maxilla
 i = Os palatinum
 k = Mandibula
 l = Os hyoideum
 m = Epiglottis
 n = Cartilago thyreoidea
 o = Cartilago cricoidea

S. fr. = Sinus frontalis
 S. sph = Sinus sphenoidalis
 T. pa = Tonsilla palatina
 T. ph = Tonsilla pharyngea
 Uv = Uvula
 1 = Lingula cerebelli
 2 = Lobus centralis

3 = Culmen
 4 = Declive
 5 = Folium vermis
 6 = Tuber vermis
 7 = Pyramis vermis
 8 = Uvula vermis
 9 = Nodulus

Fig. 48. Median section through the head. The cut edges of the leptomeninges are red. The cut surfaces of the tela choroidea, as well as the choroid plexus, are indicated in green.



Red = neurocranium
 Green = visceral cranium
 a₄ = Squama occipitalis
 b₂ = Squama temporalis
 c₁ = Praesphenoid
 c₂ = Basisphenoid (Dorsum sellae)
 c₃ = Os sphenoidale, Ala major

d = Os parietale
 e₂ = Os ethmoidale, Lamina orbitalis
 e₃ = Os ethmoidale, Lamina mediana
 i = Os zygomaticum
 Cb = Cerebellum
 C. sph = Concha sphenoidalis
 F. h = Fossa hypophyseos

H. = Cellulae ethm. post.
 H. I = Lobus occip.
 M. = Mesencephalon
 S. = Septum sinus sphenoid.
 Sch. I = Lobus temp.
 S. sph = Sinus sphenoidalis
 V = Cellulae ethm. ant.

Fig. 49. Horizontal section through the head at the level of the external occipital protuberance. On the left, the skeleton with muscles; on the right, mucosal membranes and the contents of cranial spaces.

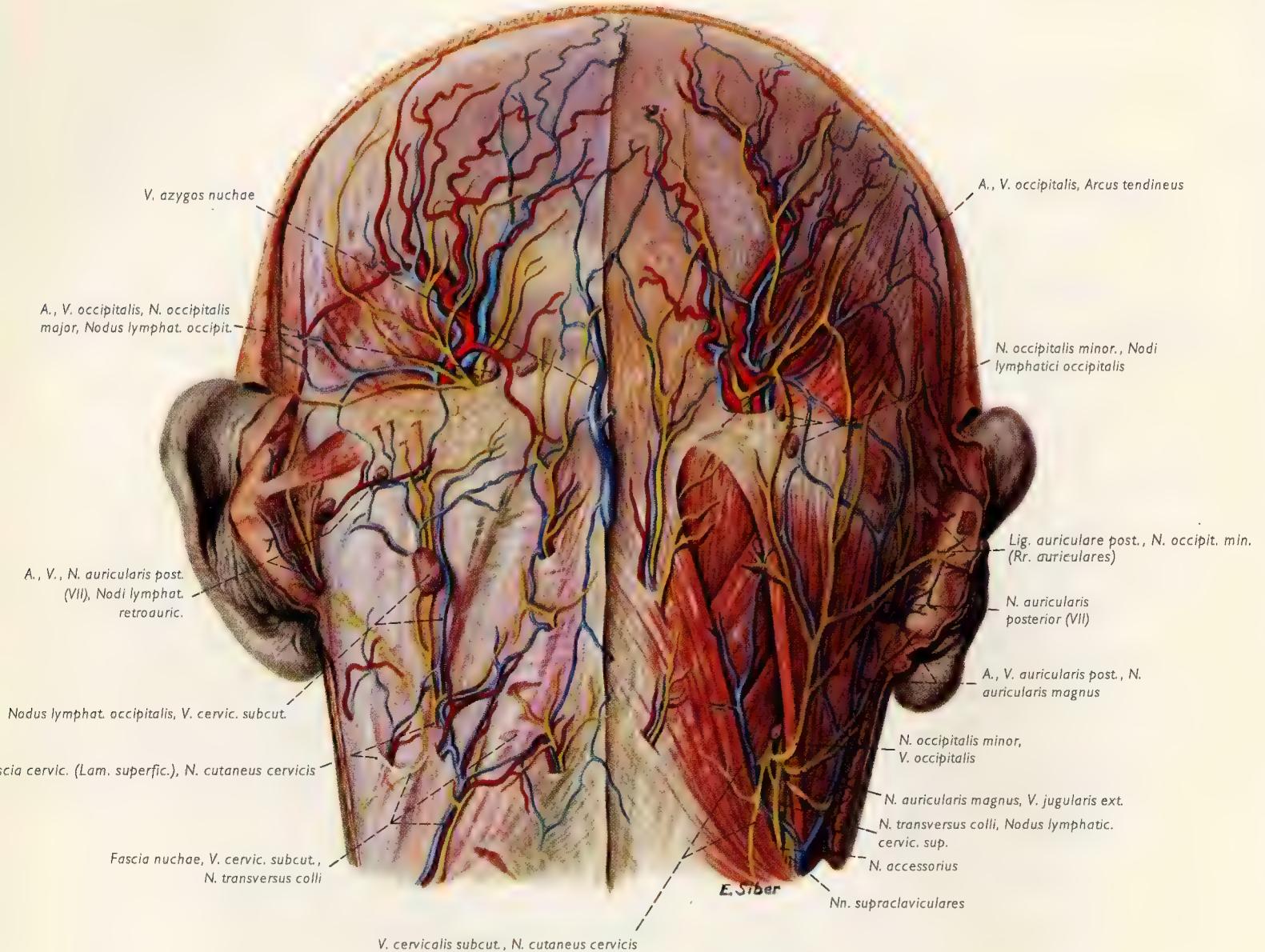


Fig. 50. Blood vessels and nerves of posterior head region and upper neck.

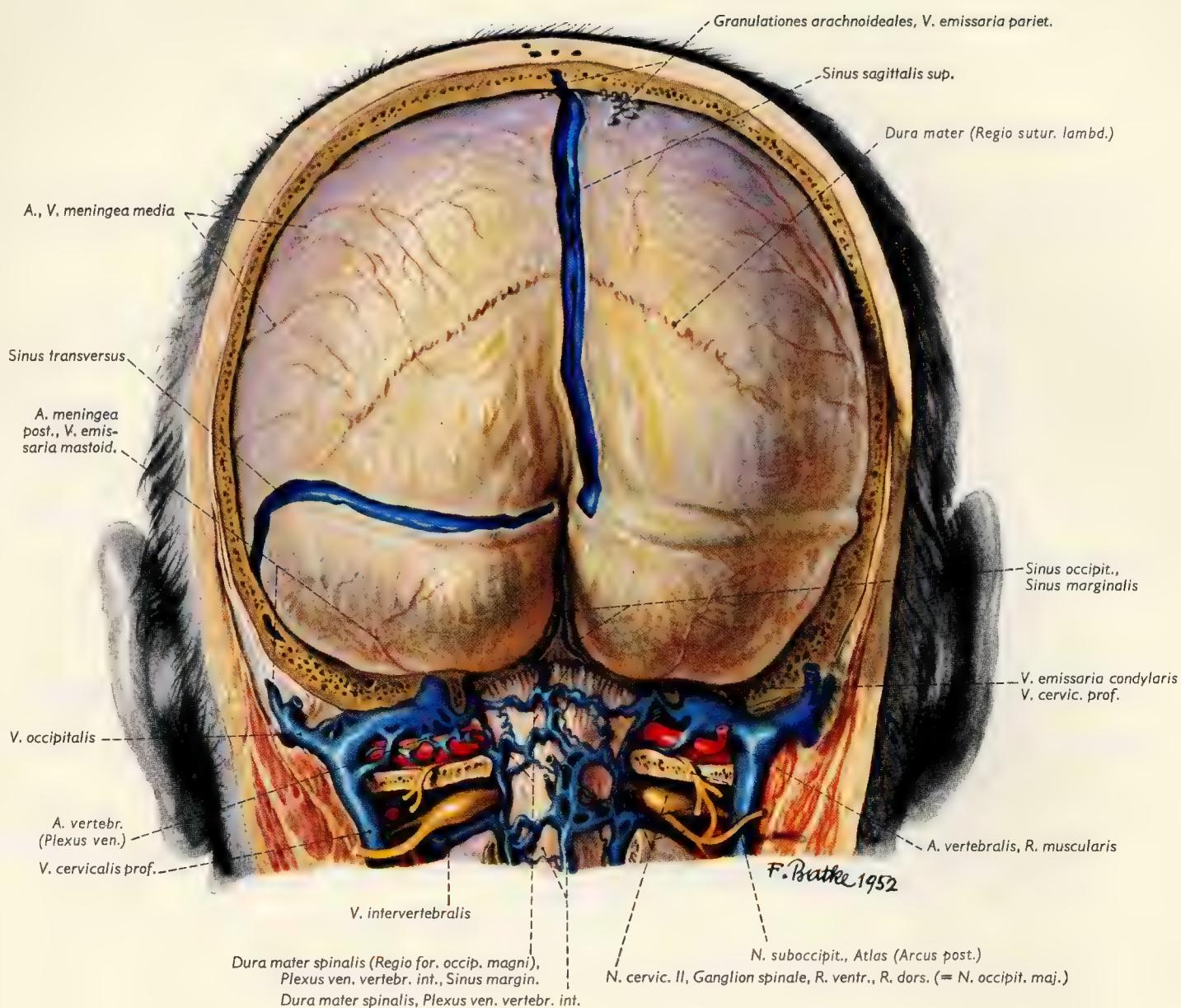


Fig. 51. Dura mater and the dural sinuses of the posterior head region.

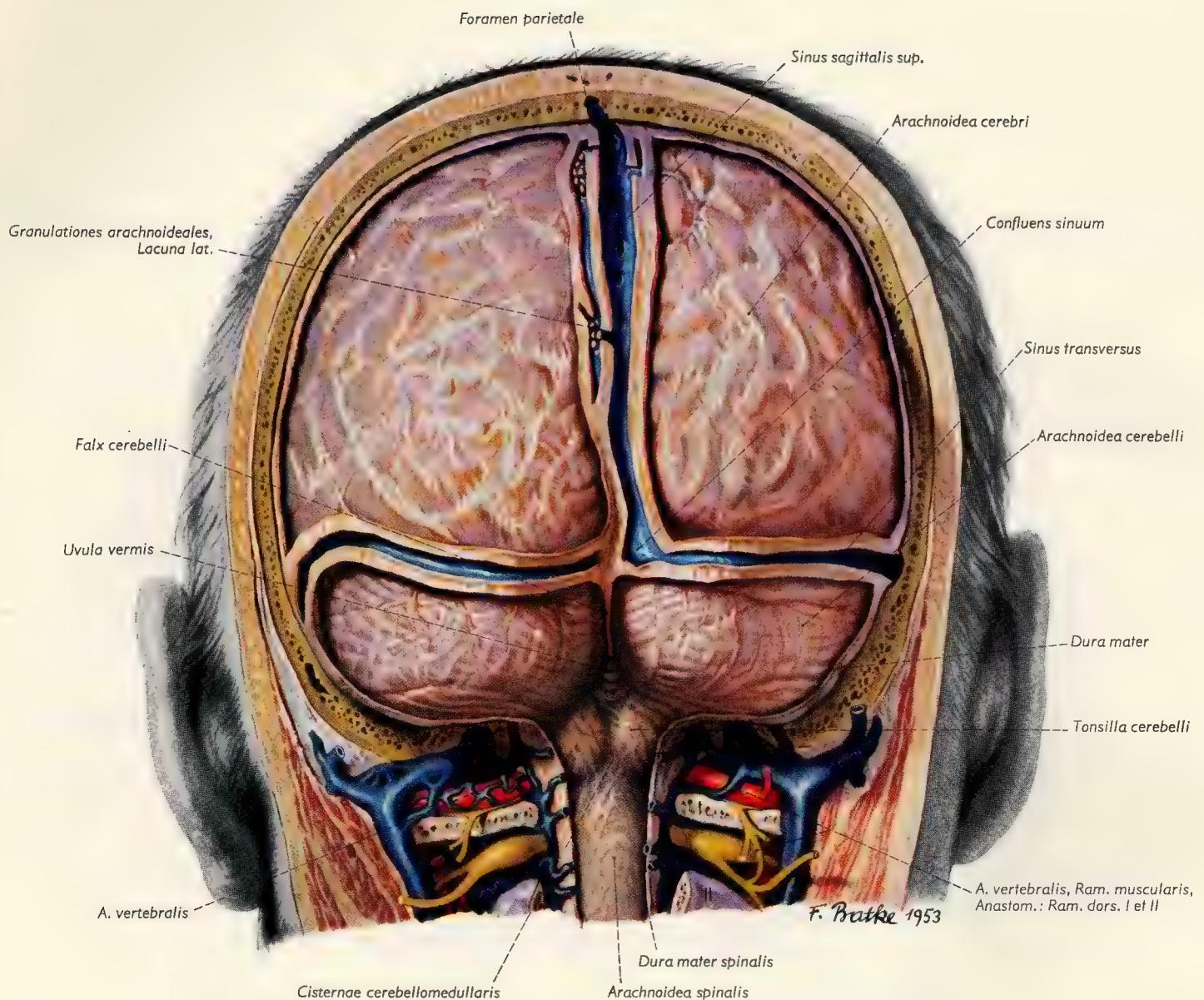
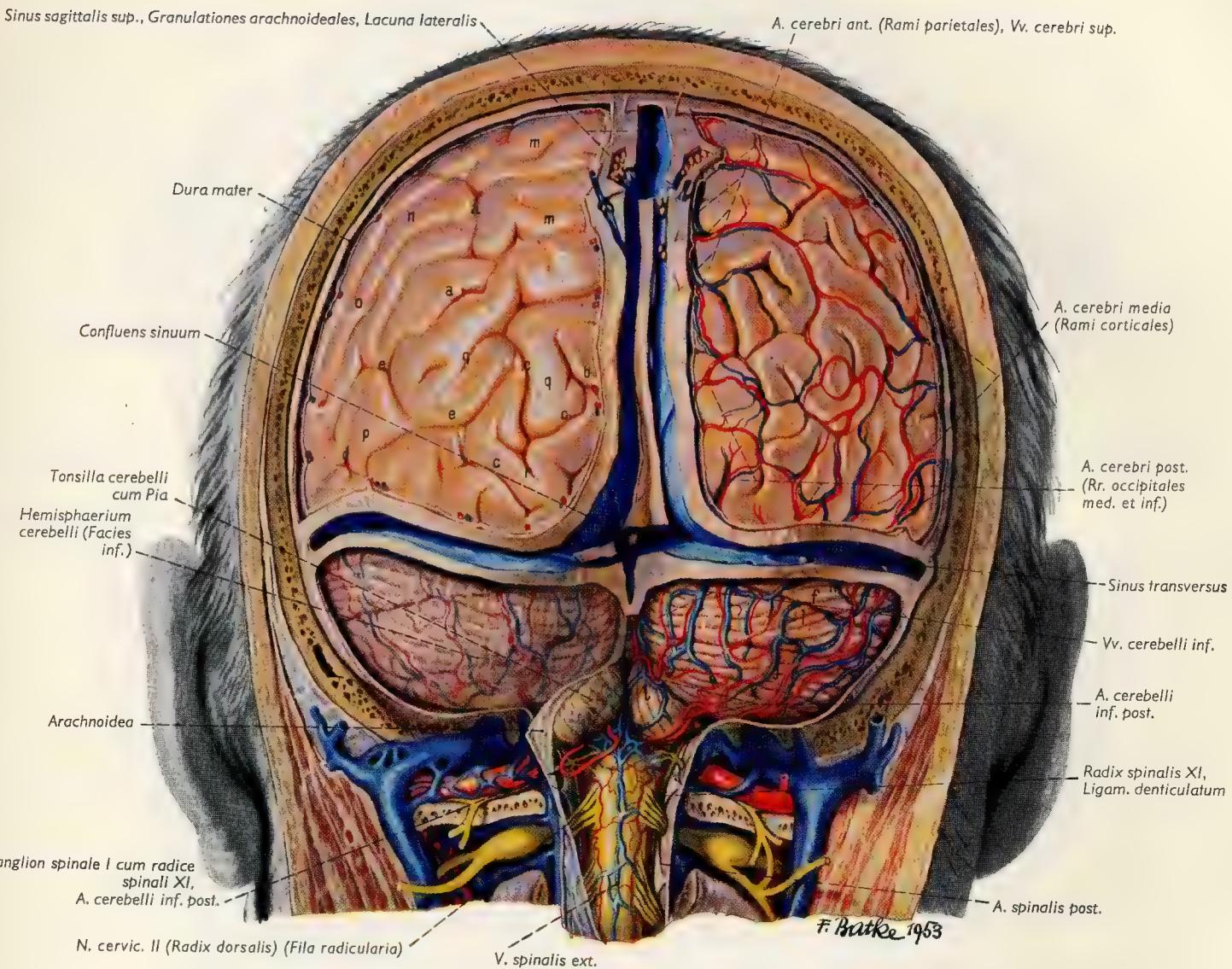


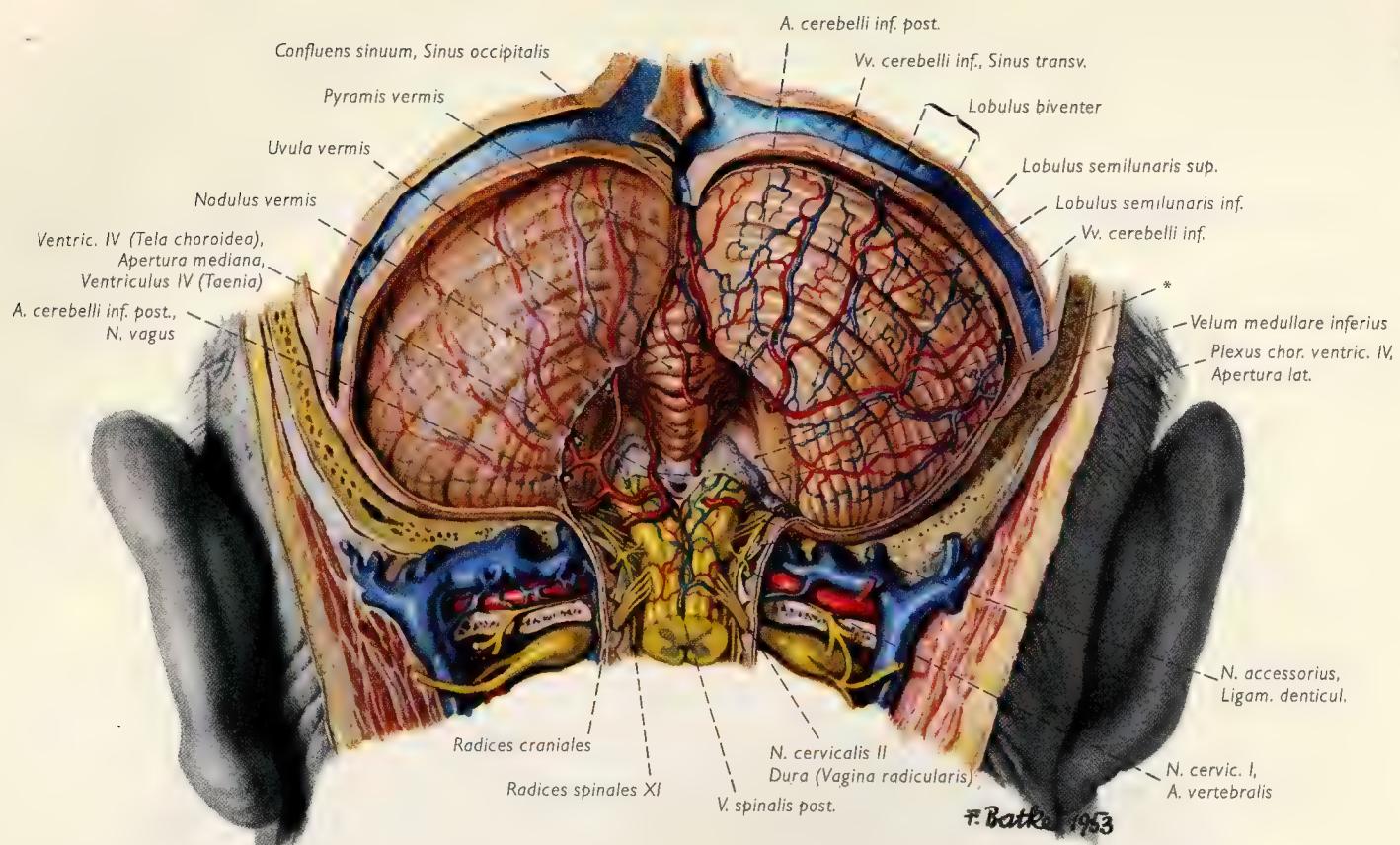
Fig. 52. Parietal and occipital lobes with cerebellum and medulla oblongata exposed from behind. The dura mater has been removed except for those portions immediately adjacent to the falx cerebri, the tentorium and the falk cerebelli. All portions of the brain are enclosed by the intact arachnoid layer.



a = Sulcus intraparietalis
 b = Sulcus parietooccipitalis
 c = Sulci occipit. sup.
 d = Sulci occipit. lat.
 e = Sulcus occip. transv.
 f = Fissura horizontalis cerebelli
 g = Pyramis, Uvula
 h = Lobulus semilunaris sup.
 i = Lobulus semilunaris inf.

j, k = Lobulus biventer
 l = Tonsilla cerebelli
 m = Lobulus pariet. sup.
 n = Lobulus pariet. inf.
 (Gyrus supramarg.)
 o = Gyrus angularis
 p, q = Gyri occipitales lat.
 r = Polus occipitalis

Fig. 53. Telencephalon, cerebellum, medulla oblongata and upper cervical cord seen from behind. The cerebellomedullary cistern has been opened.



* = Cut surface after removal of the tonsil

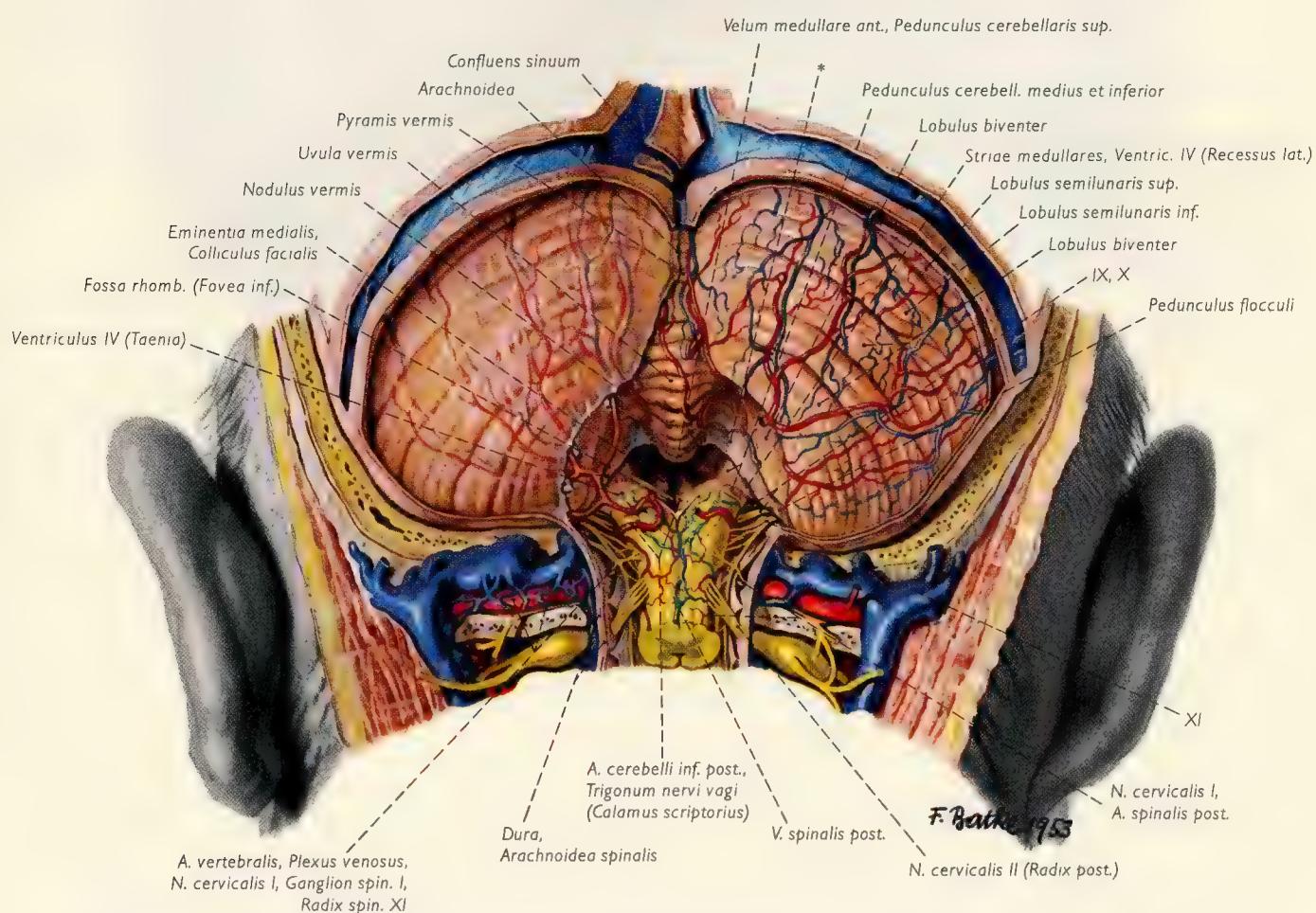
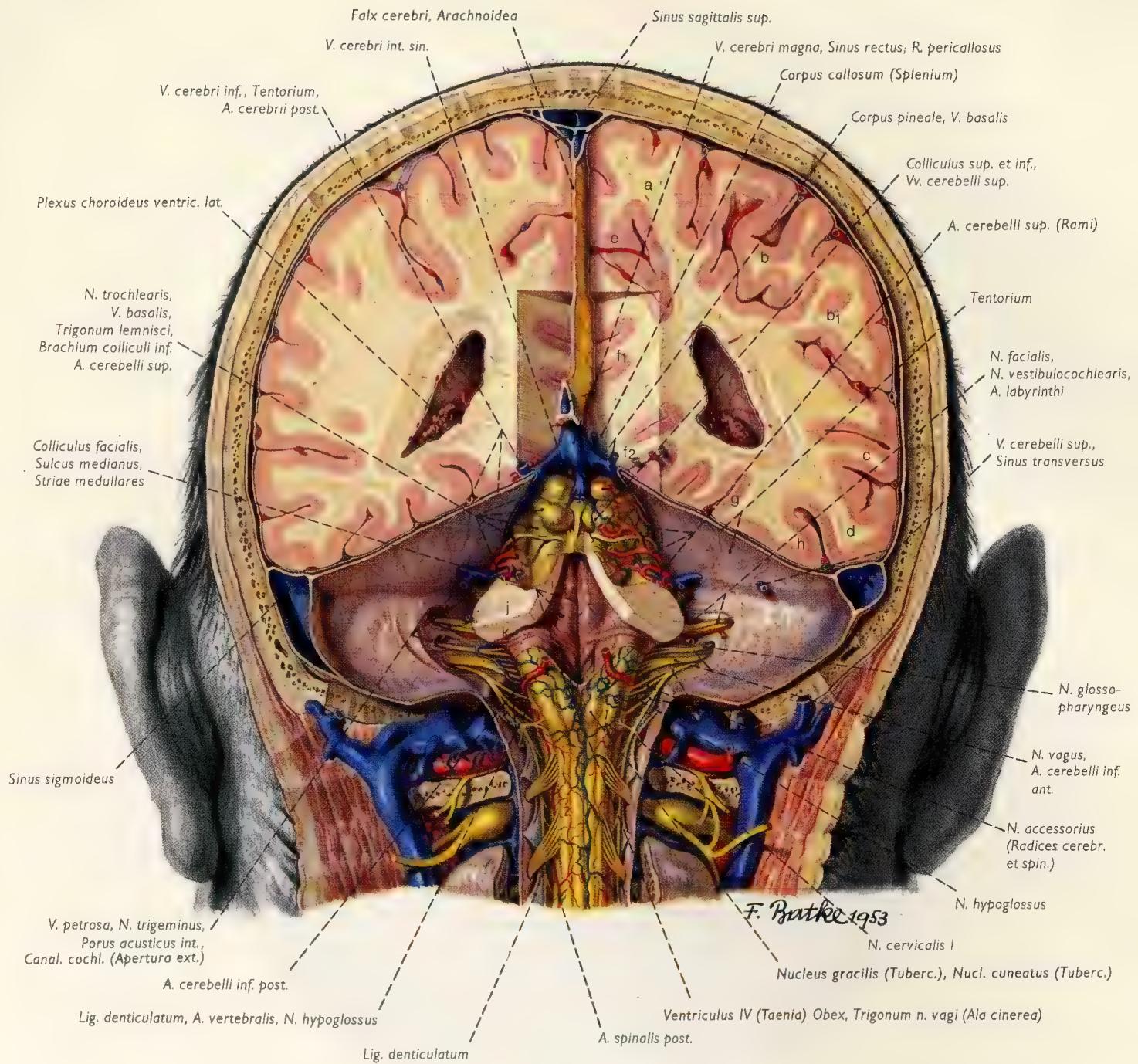


Fig. 54. (Top) Exposure of the under surface of cerebellum, the roof of the fourth ventricle and the medulla oblongata with associated vessels and nerves, from behind.

Fig. 55 (Bottom) View as in Fig. 54, but the choroid layer of the fourth ventricle has been removed so that the ventricle and the outline of the rhomboid fossa may be seen.

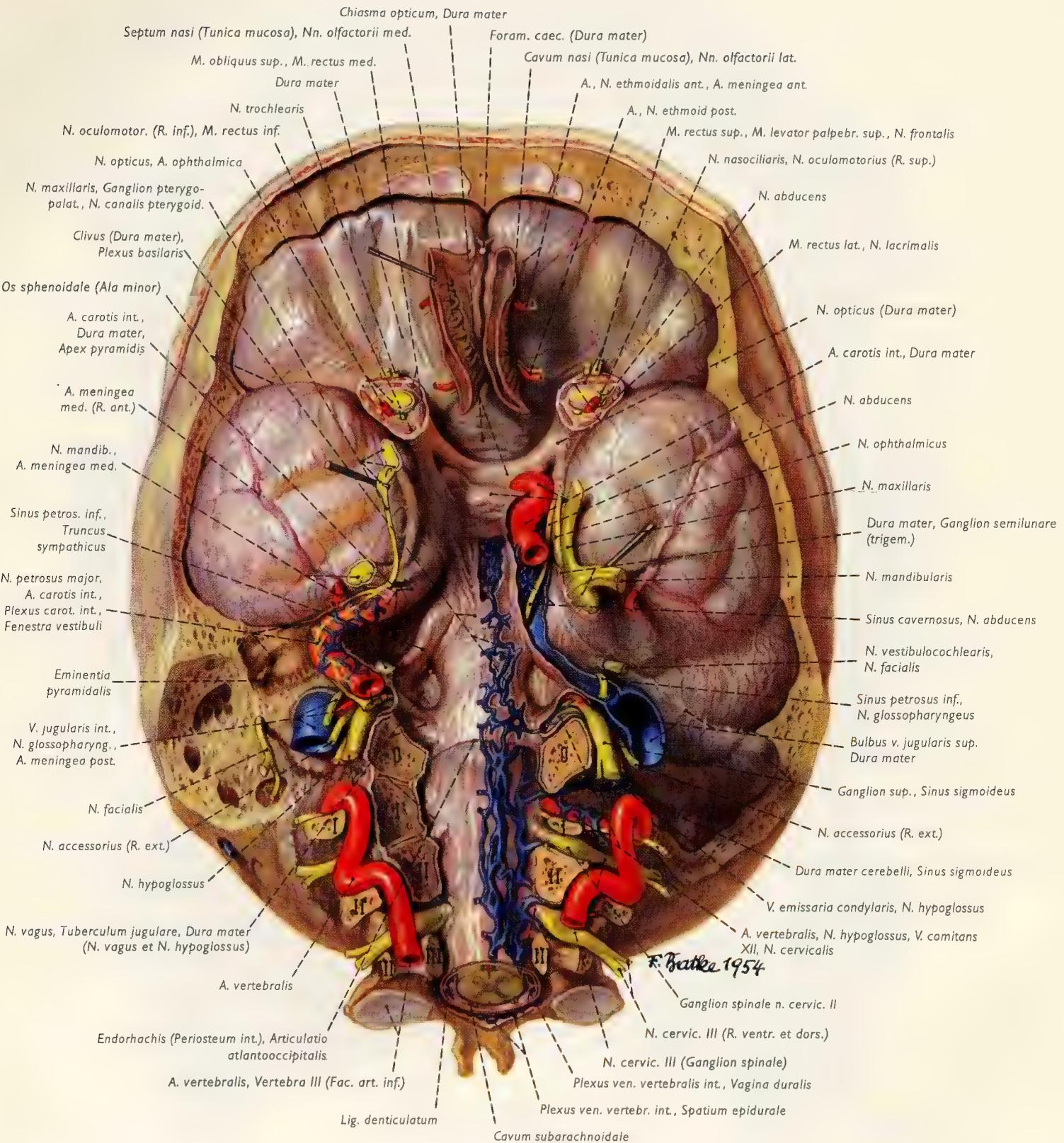


a = Lobulus parietalis sup.
 b, b₁ = Lobulus parietalis inf.
 c = Gyrus temporalis med.
 d = Gyrus temporalis inf.
 e = Praecuneus

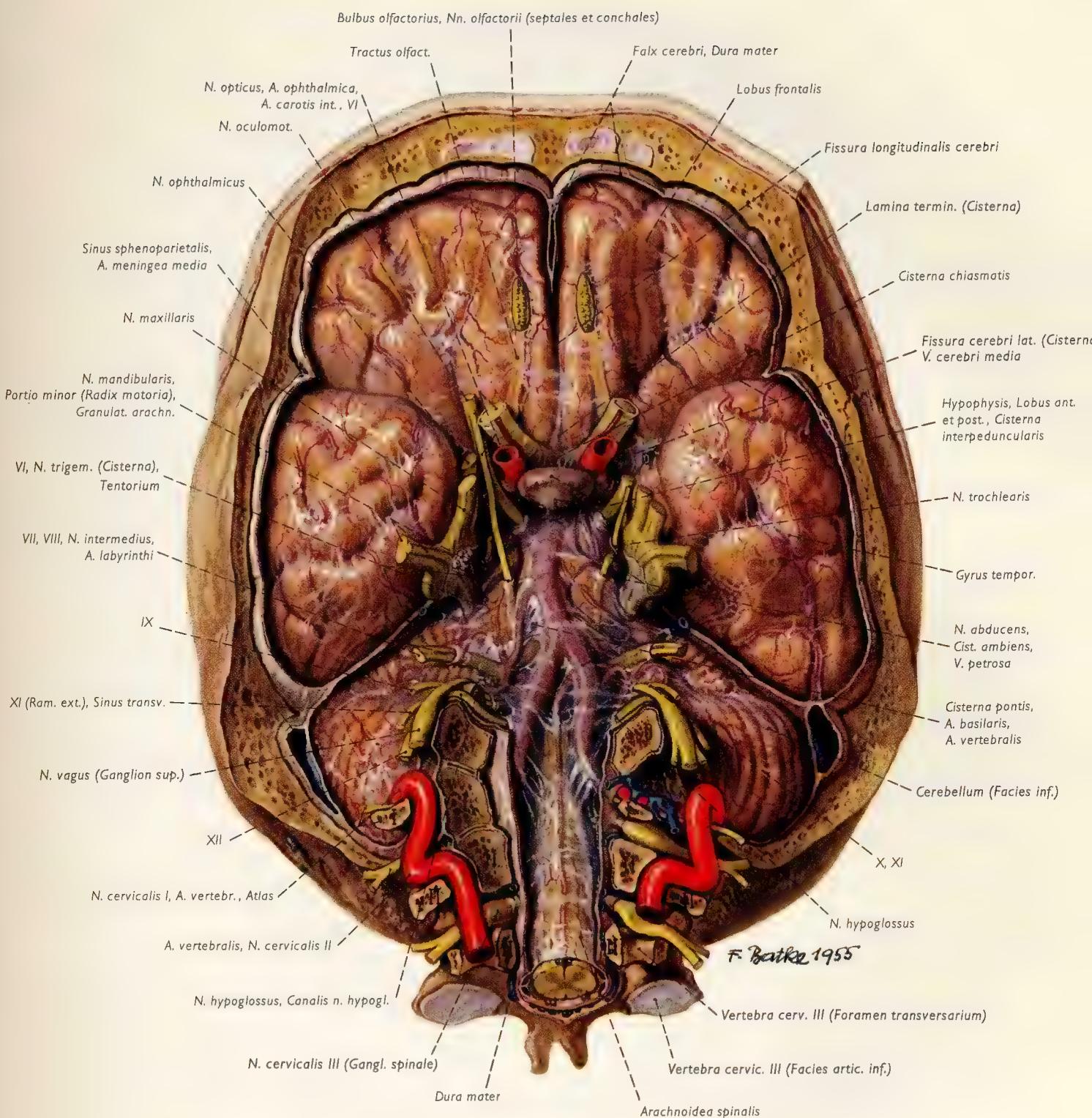
f₁ = Gyrus cinguli
 f₂ = Gyrus parahippocampalis
 g = Gyrus occipitotemp. med.
 h = Gyrus occipitotemp. lat.

i = Pedunculus cerebellaris sup.
 j = Pedunculus cerebellaris med.
 k = Pedunculus cerebellaris inf.
 l = Velum medullare ant.

Fig. 56. Exposure of the brain stem and the upper cervical cord from behind. Cerebellum has been removed at the level of its peduncles. View into the subtentorial space and the rhomboid fossa.



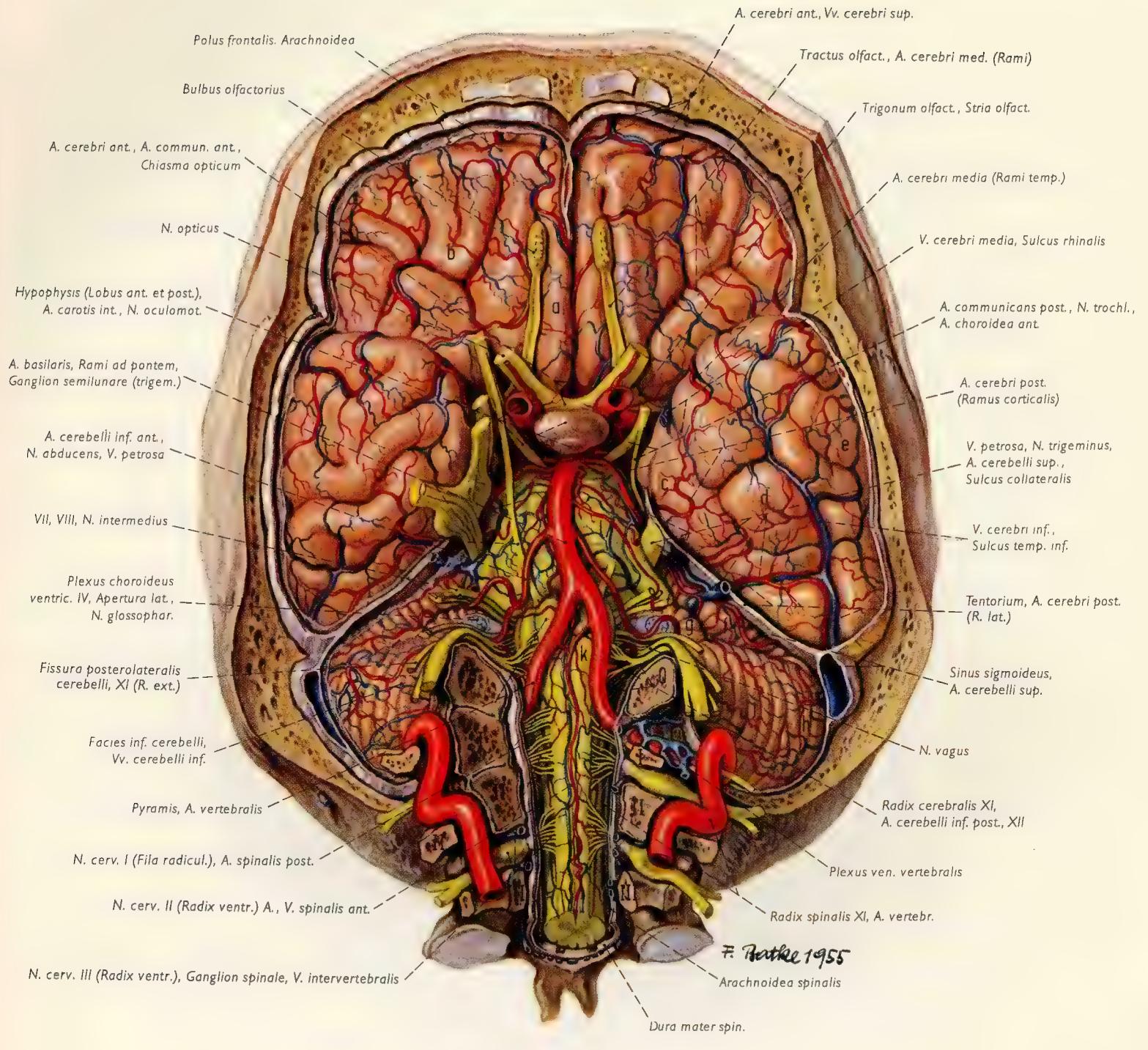
Number code as in Fig. 58.



0 = Condylus occipitalis
I = Atlas, Massa lat.; left: Arcus post.

II = Axis, Corpus
III = Proc. transversus vertebrae cervic.

Fig. 58. Anterior, inferior view of the brain and the cervical cord with an intact arachnoid membrane. The basal cisterns. Note the passage of the cranial nerves through the funnel-like extensions of the arachnoid, and the trigeminal cistern that forms an outpocketing toward the semilunar ganglion.

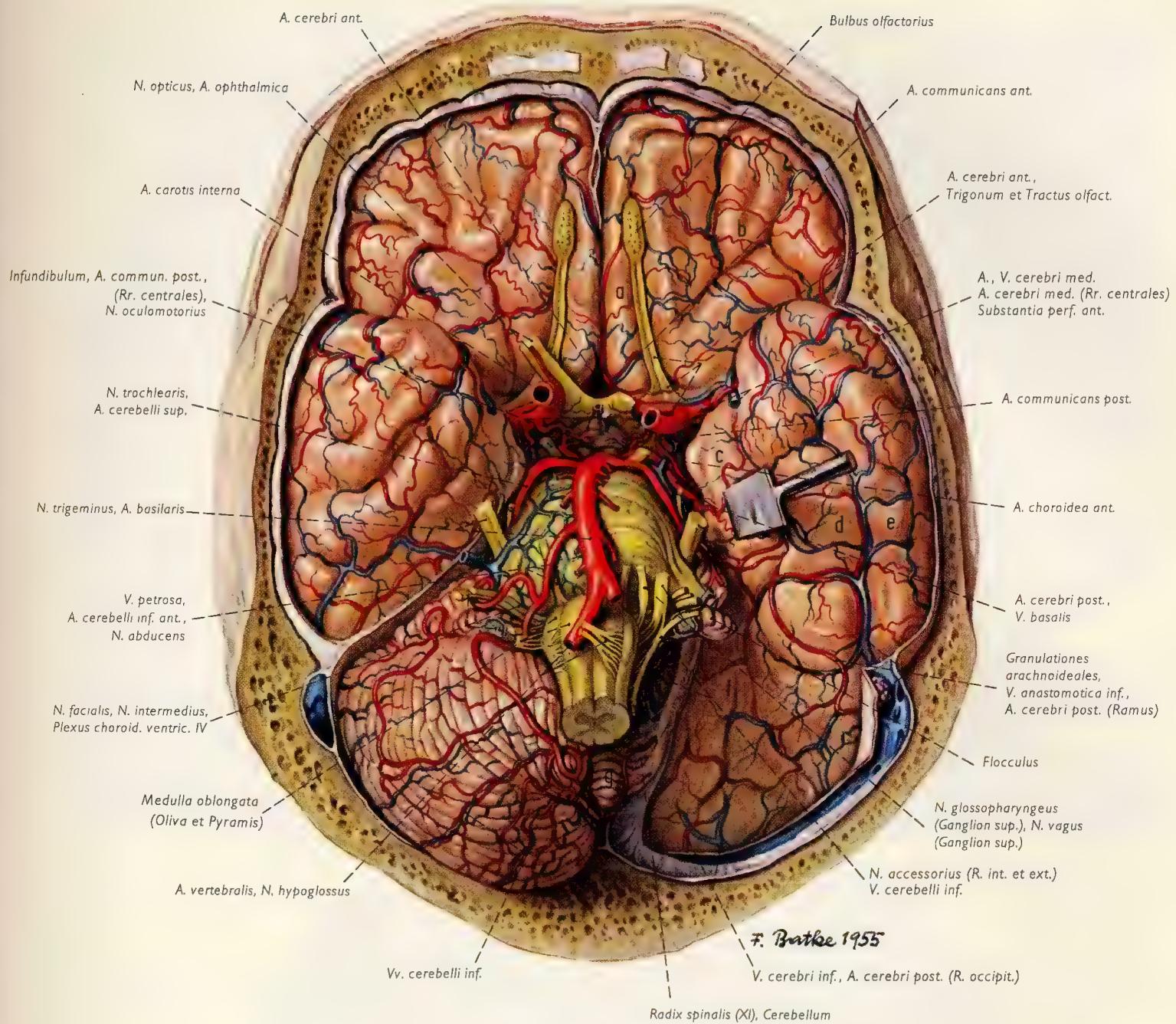


a = Gyrus rectus
b = Gyri and Sulci orbitales
c = gyrus parakippocampalis

d = Gyrus occipitotemporalis lat.
e = Gyrus temporalis inf.
f = Lobulus quadrangularis sup. and inf.
g = Flocculus

h = Lobulus semilunaris inf.
j = Lobulus biventer
k = pyramid
l = Pons

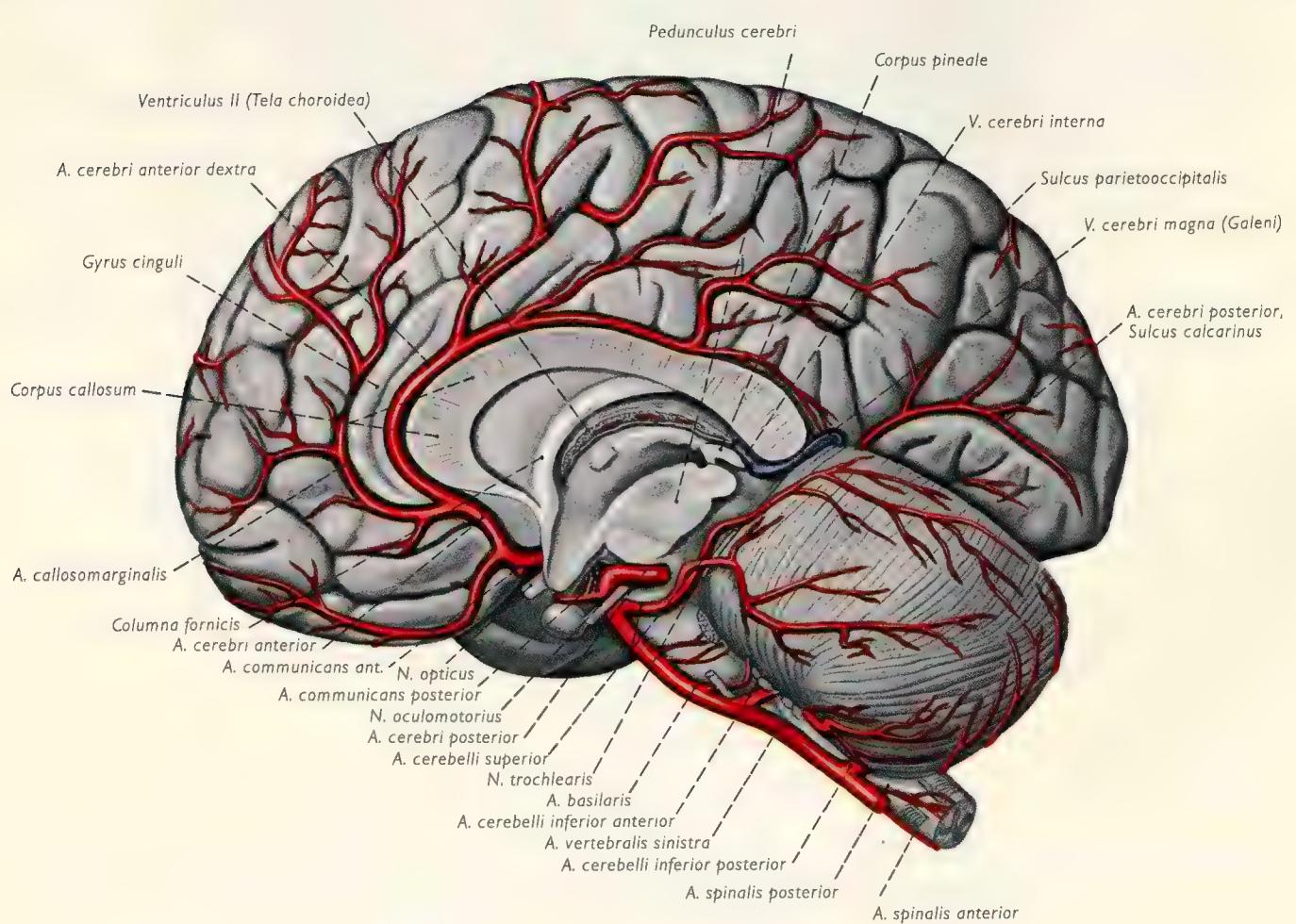
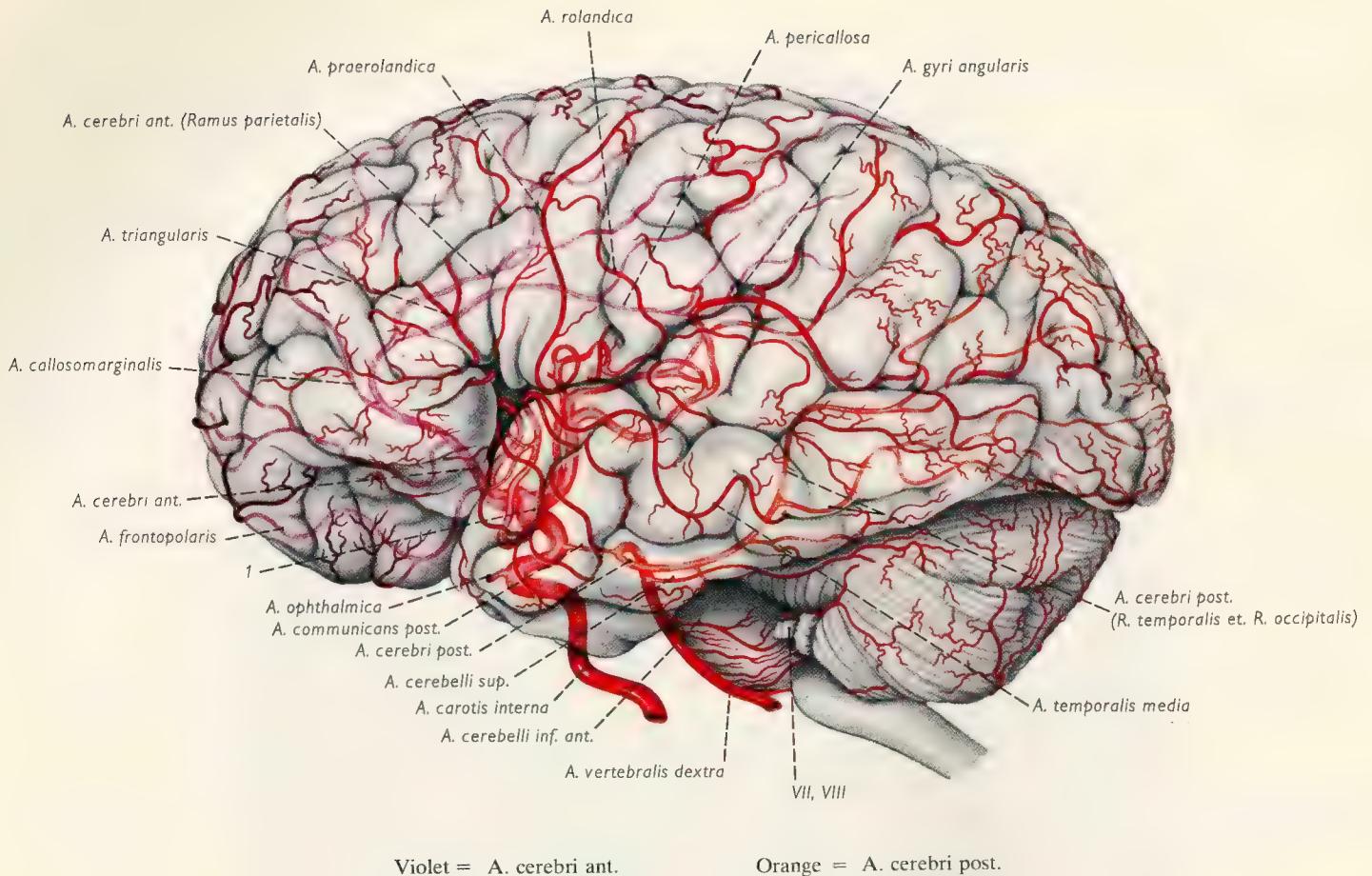
Fig. 59. View of brain from the base of the skull. The arachnoid has been removed and the basal cisterns have been opened so that vessels and nerves at the base of the brain can be seen.



a = Gyrus rectus
 b = Gyri orbitales
 c = Gyrus hippocampi
 d = Gyrus occipitotemporalis lat.
 (fusiformis)

e = Gyrus temporalis inf.
 f = Gyrus occipitotemporalis med.
 (lingualis)
 g = Pyramis vermis

Fig. 60. The basal surface of the brain with blood vessels. The cerebral arterial circle.



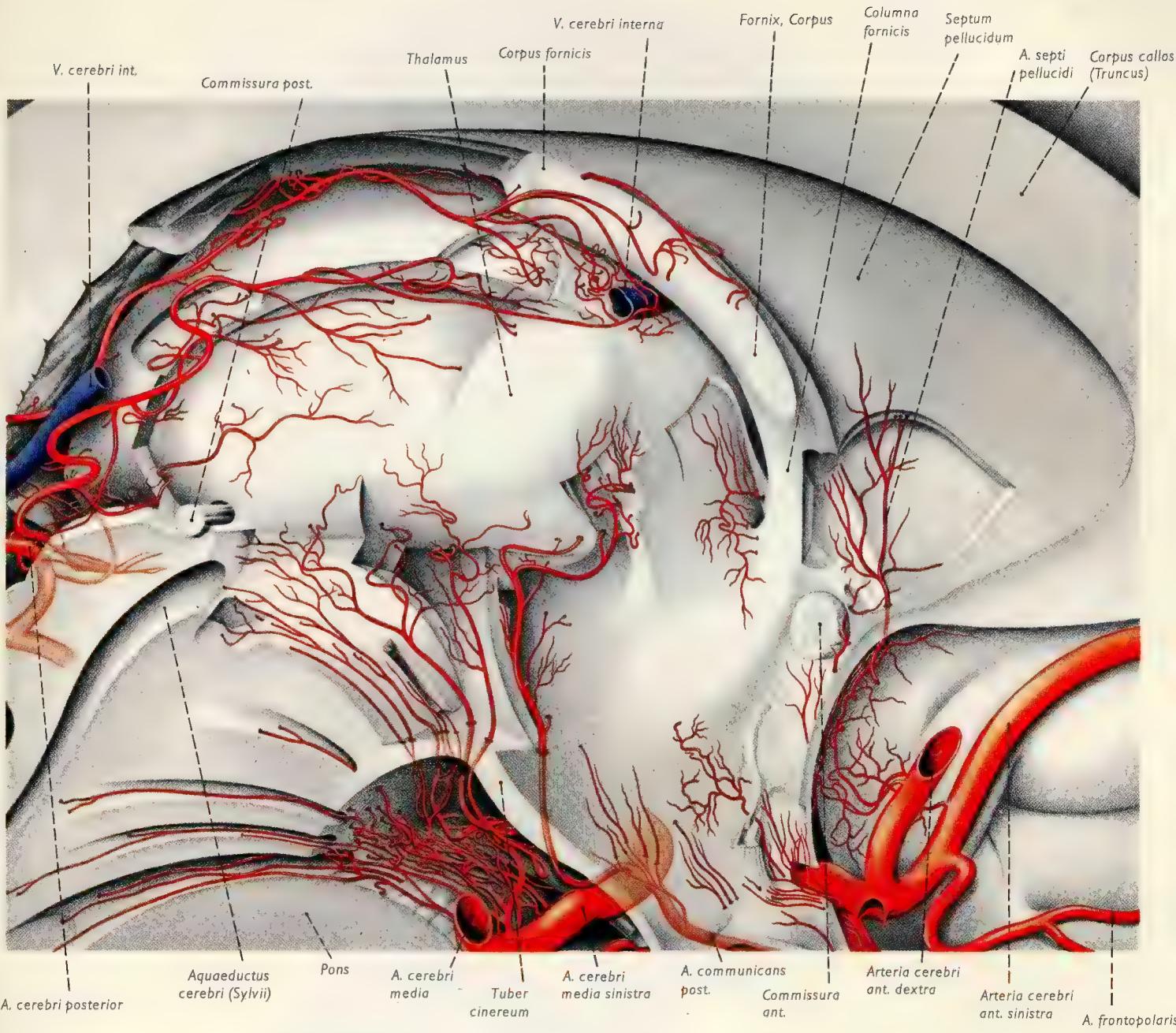


Fig. 63. Arteries of the human upper brainstem, in particular those of the basal ganglia. Medial view of left hemisphere. Note the origin of 10–20 central perforating arteries from the middle cerebral artery and their entrance into the posterior perforated substance (injection preparation by H. Ferner and W. Trost).

Fig. 61. (Left, top) Lateral view of the arteries of the left hemisphere. Injection preparation. The brain is depicted as translucent so that a direct comparison may be made with an arteriogram. The terminal branches of the anterior and posterior cerebral arteries curve around the borders of the hemisphere to continue onto the convex surface (after Ferner/Kautzky in: Handbuch der Neurochirurgie, Vol. 1, Berlin–Heidelberg–New York, 1959).

Fig. 62. (Left, bottom) Arteries on the medial aspect of the cerebrum (right hemisphere) and the surface of cerebellum. Left hemisphere has been removed. Medial view (after Sobotta/Becher).

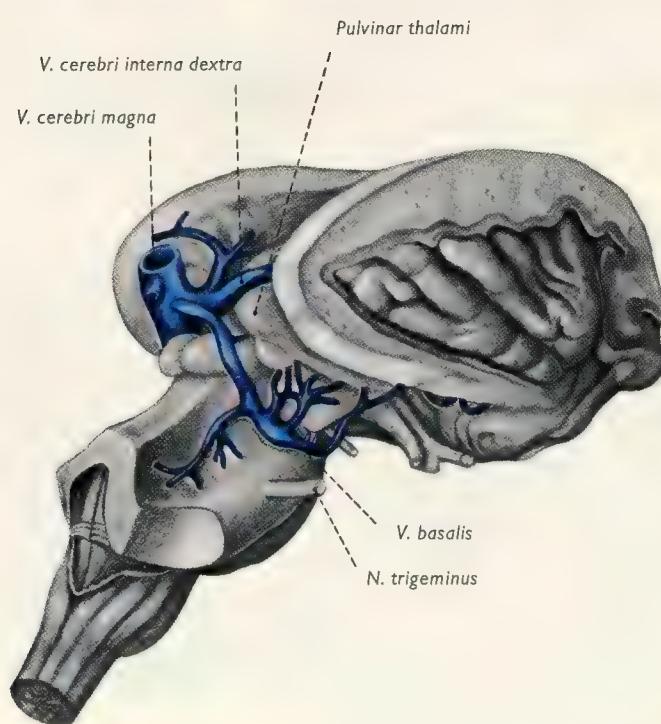
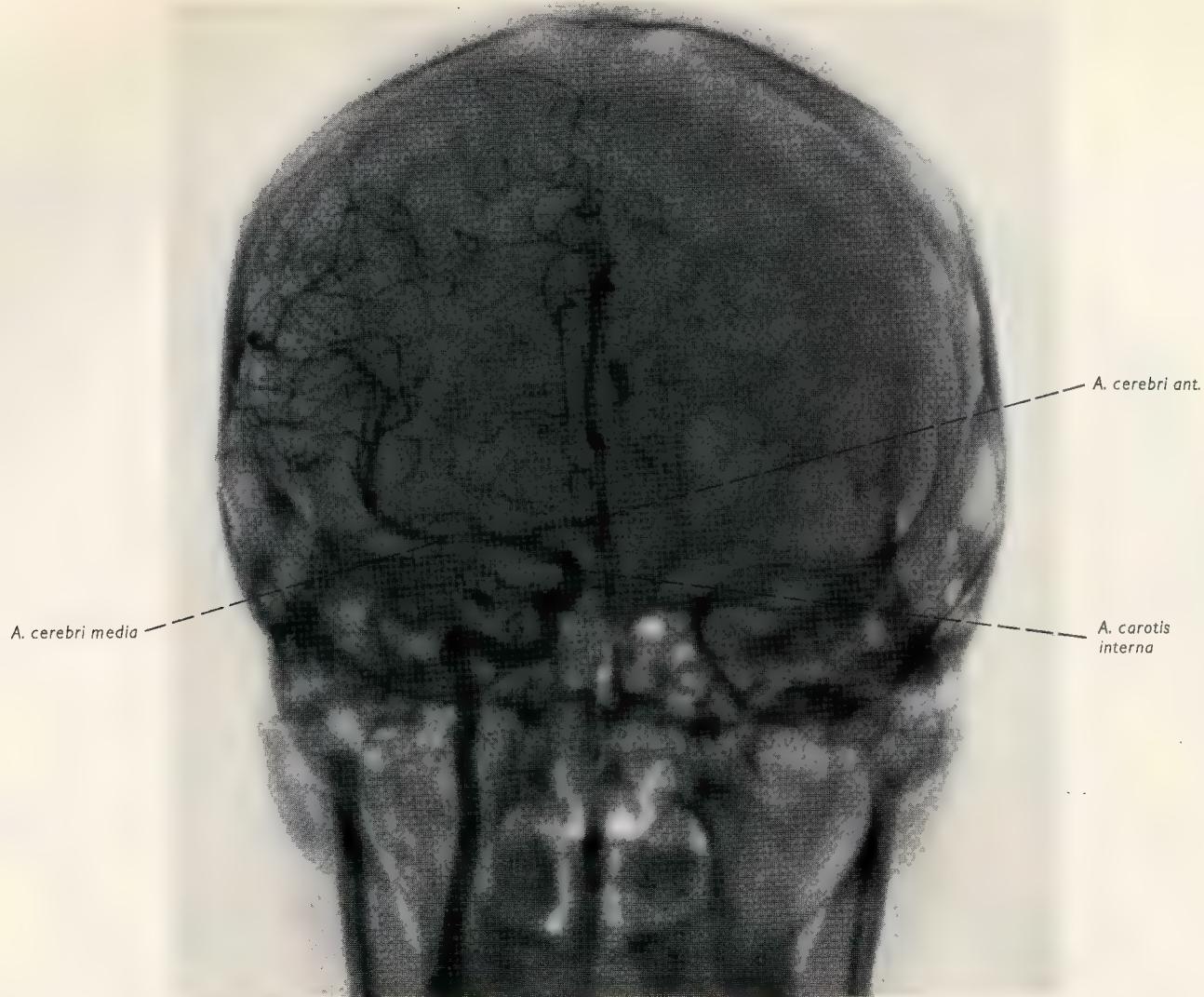


Fig. 64. (Top) Right anteroposterior carotid angiogram. Note the T-shaped branching at the end of the carotid siphon with the anterior cerebral a. going medially and the middle cerebral a., laterally. The terminal branches of the ant. cerebral a. curve around the border of the hemisphere to continue on the convex surface.

Fig. 65. (Bottom) Vena basalis (of Rosenthal) and Vena cerebri magna (of Galen) [after Toldt/Hochstetter].

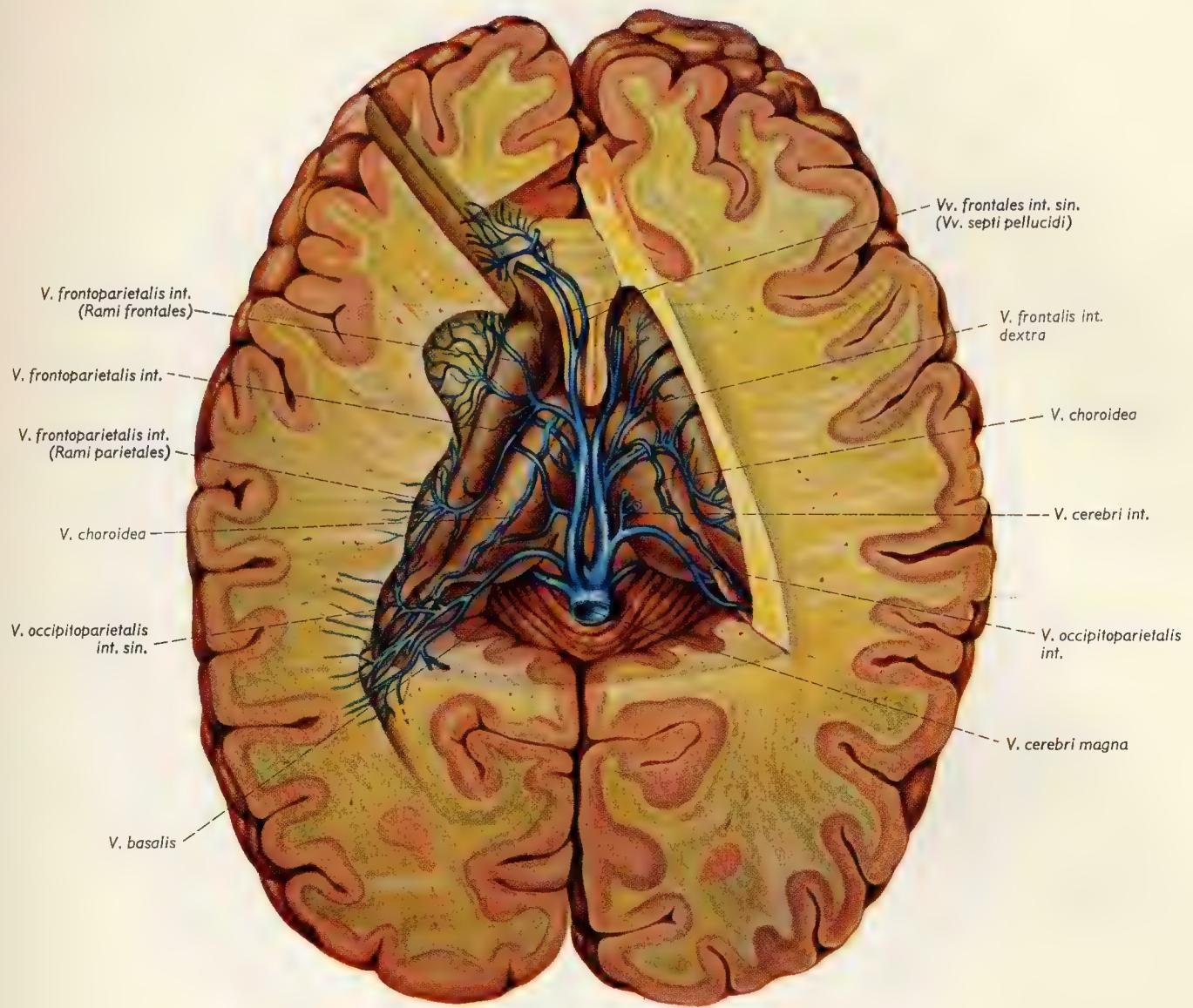


Fig. 66. The internal cerebral veins and their tributaries; left: typical, right: variation.

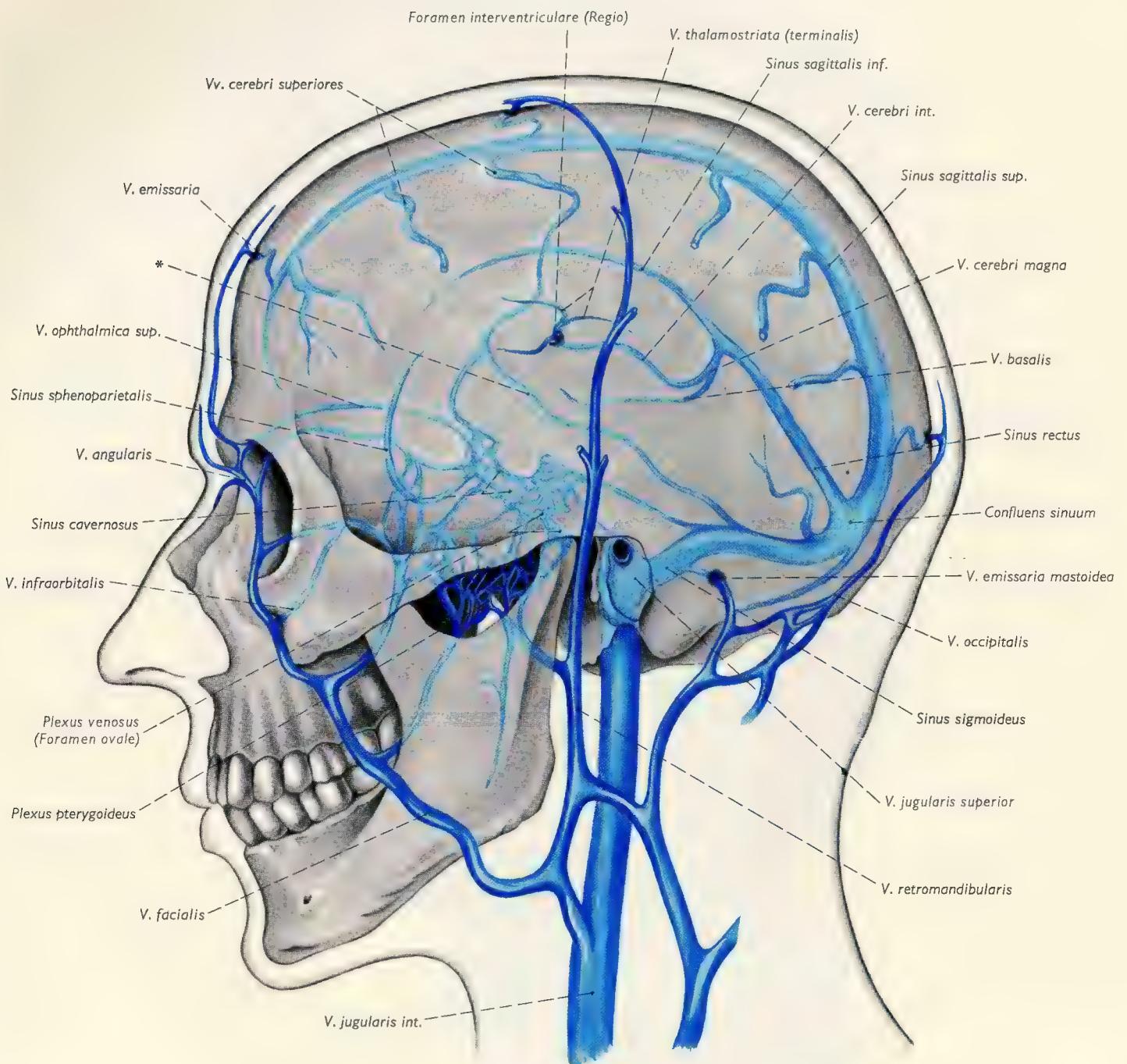


Fig. 67. Venous trunks of the head, and dural sinuses with anastomoses between the venous networks. The dural sinuses and veins obscured by bone are drawn on a translucent skull (after Ferner/Kautzky in: Handbuch der Neurochirurgie, Vol. 1, Berlin–Heidelberg–New York, 1959).

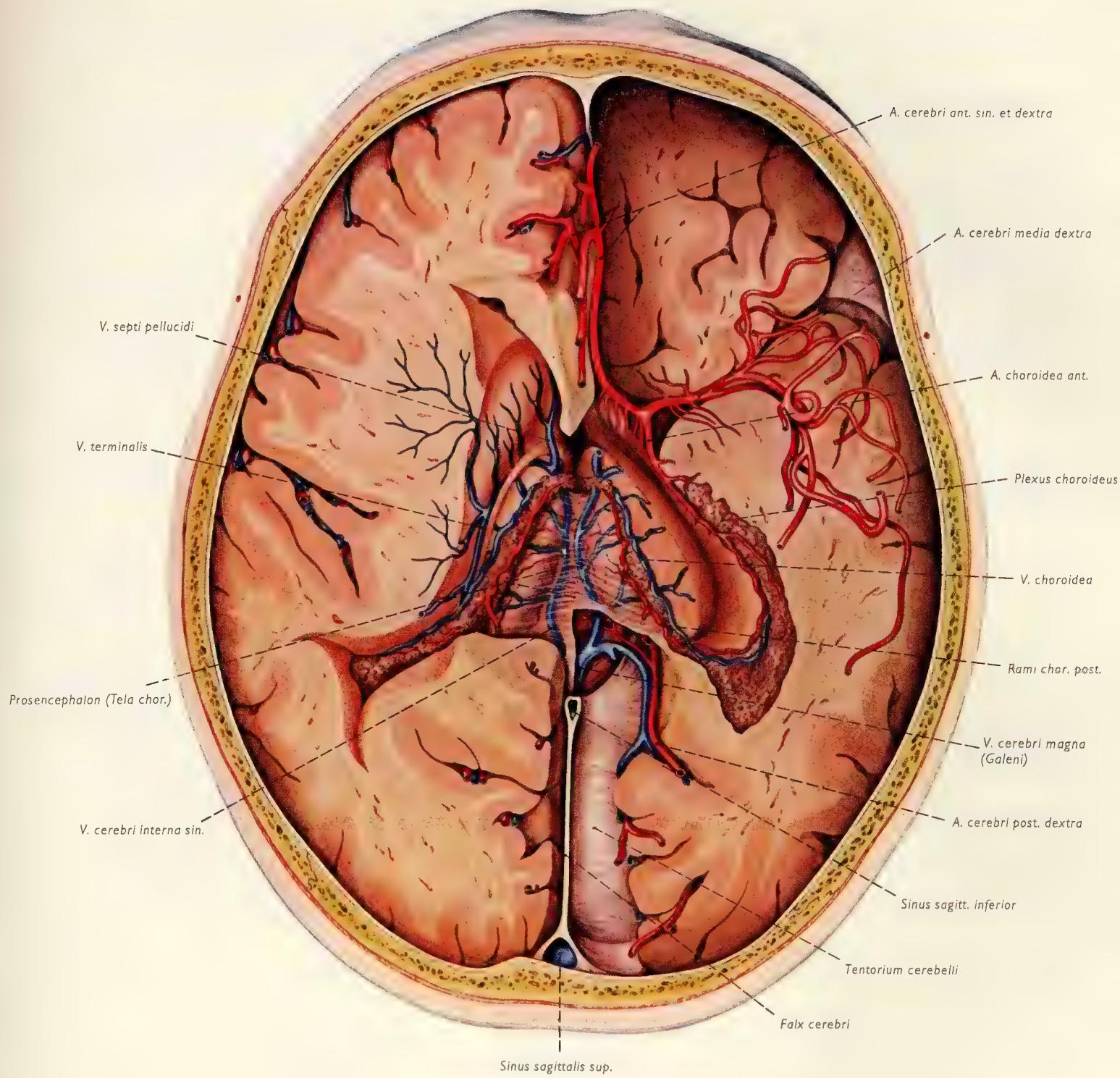
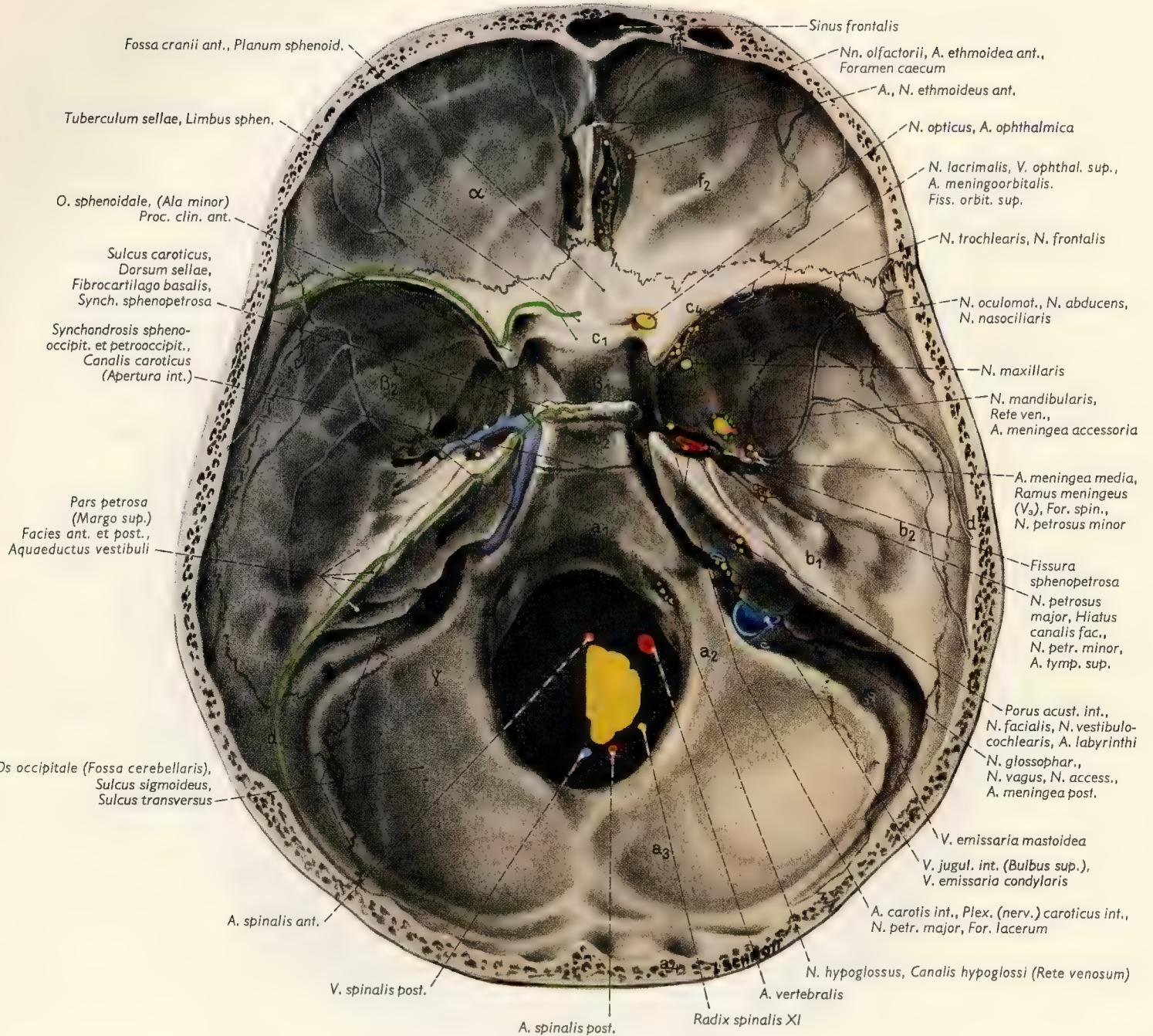


Fig. 68. Horizontal section of the brain with the branching and distribution of the anterior, middle and posterior cerebral arteries. Location and course of the deep cerebral veins.



α = Fossa cranii ant.
 β_1 = Fossa hypophysialis
 β_2 = Fossa cranii media
 γ = Fossa cranii post.
 a_1 = Os occipitale, Pars basilaris
 a_2 = Os occipitale, Pars lateralis

a_3 = Os occipitale, Squama
 a_4 = Os occipitale, Squama
 b_1 = Os temporale, Pars petrosa
 b_2 = Os temporale, Squama
 c_1 = Os praesphenoidale
 c_2 = Os basisphenoidale

c_3 = Os sphenoidale, Ala major
 c_4 = Os sphenoidale, Ala minor
 d = Os parietale
 f_1 = Squama frontalis
 f_2 = Os frontale, Pars orbitalis

Fig. 69. Base of the cranium seen from the inside. The three cranial fossae are separated by green lines; on the right, vessels and nerves are indicated where they pass through foramina.

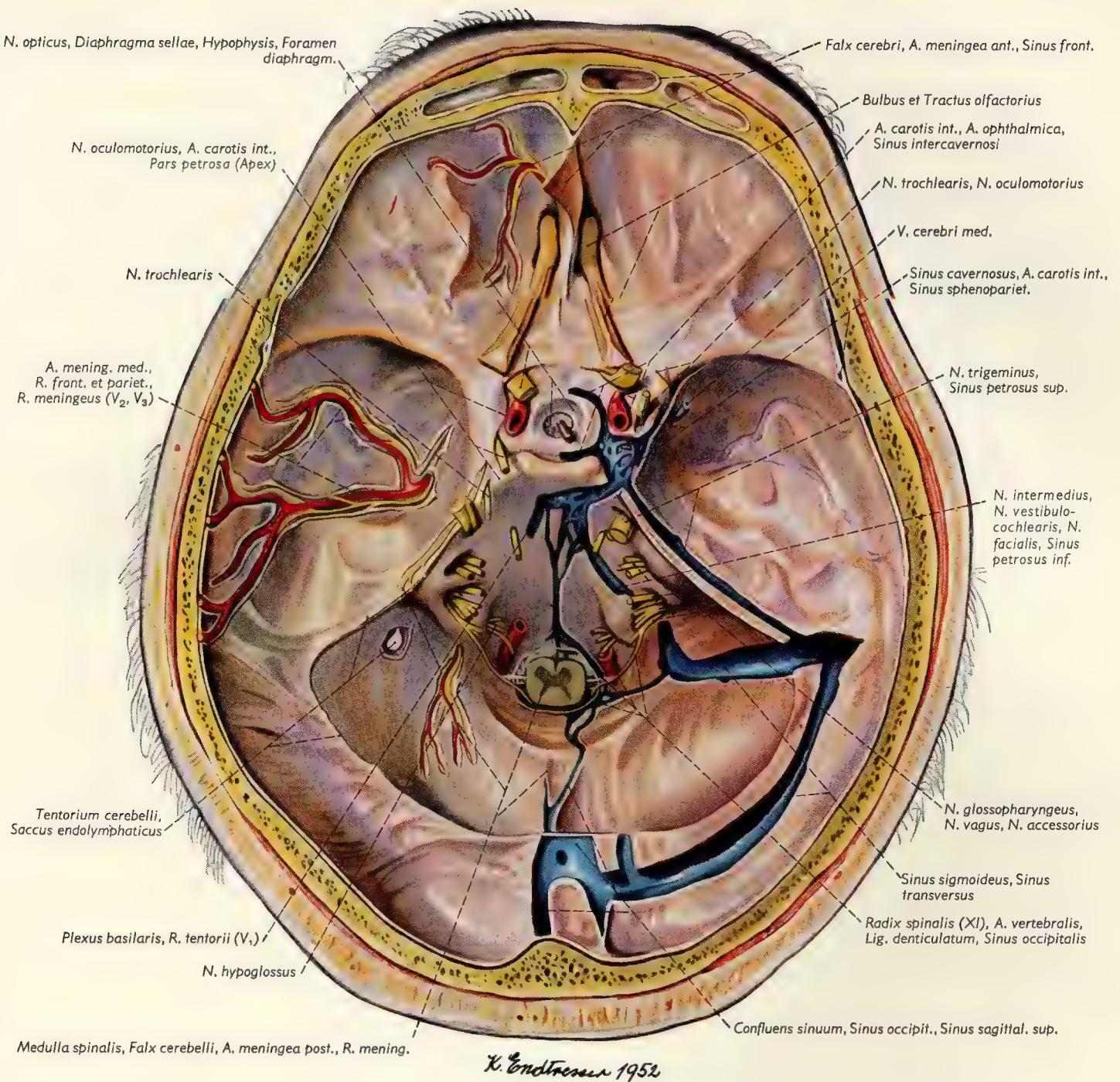


Fig. 70. Base of skull from the inside. Dural vessels and nerves (on left side); opened dural sinuses (on right side).

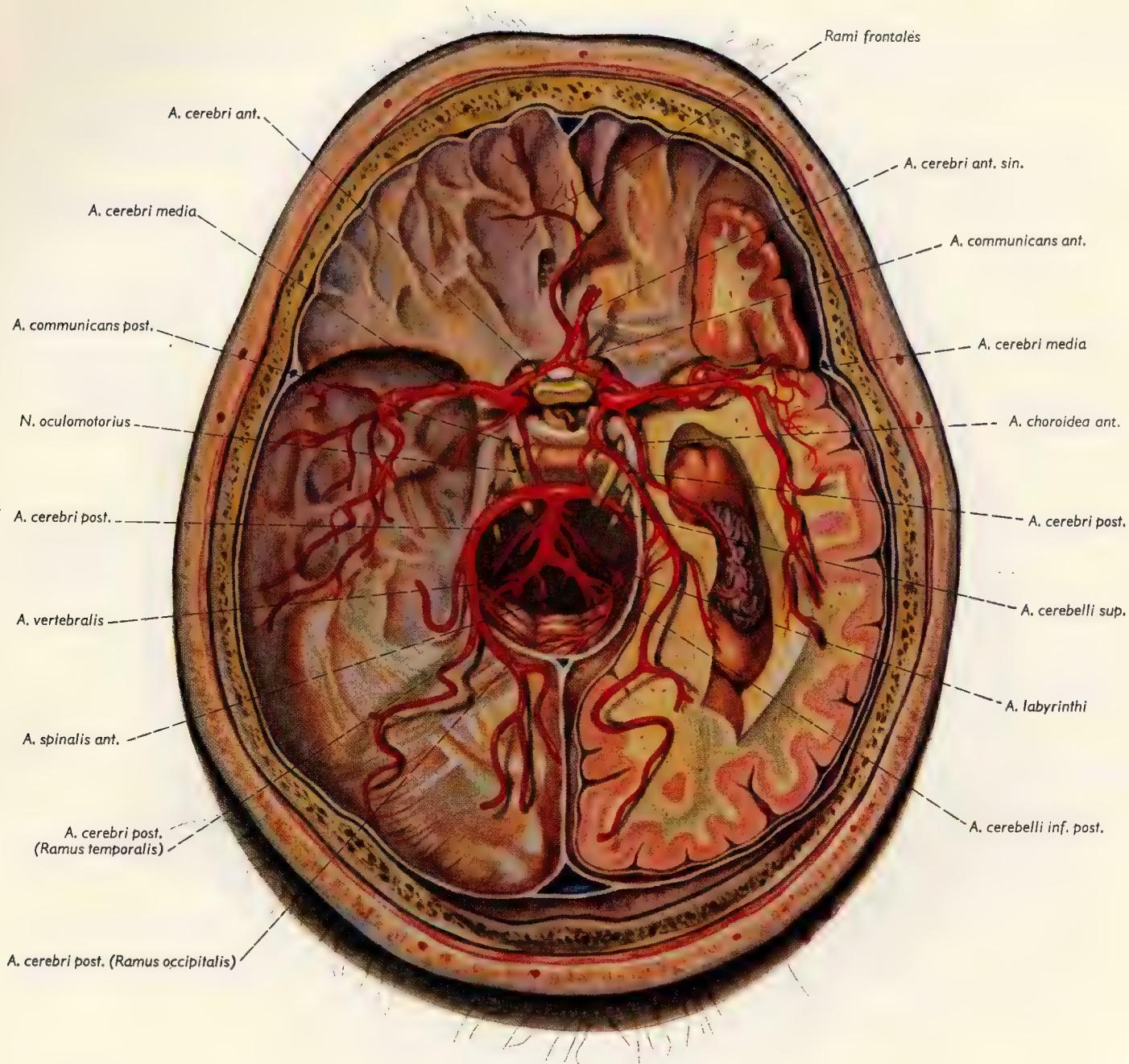


Fig. 71. The arteries of the brain and the cerebral arterial circle (of Willis) and their topographical relationship to the base of the skull and tentorium. The left hemisphere has been removed, and only portions of the occipital and temporal lobes remain on the right. The basal artery and the tentorial notch. The right posterior cerebral artery arises from the internal carotid artery (frequent variation) (drawn by K. Endtresser from an illustration in Ferner/Kautzky in: Handbuch der Neurochirurgie, Vol. 1, Berlin-Heidelberg-New York, 1959).

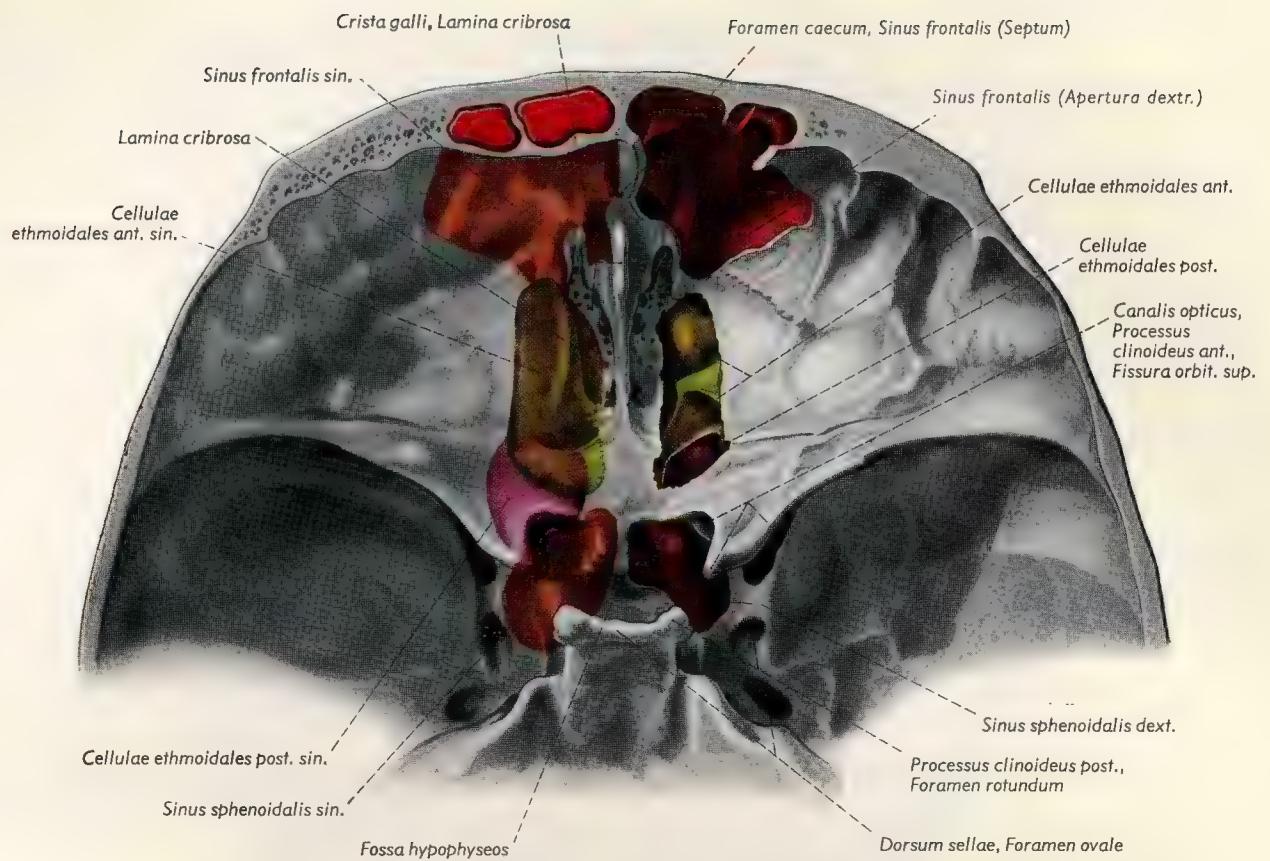


Fig. 72. The paranasal sinuses shown in different colors, viewed from above. On the left side the sinuses are projected on the bone (transparent) of the skull base. On the right, the cavity and floor of the sinuses have been brought into view by partial removal of the overlying bone.

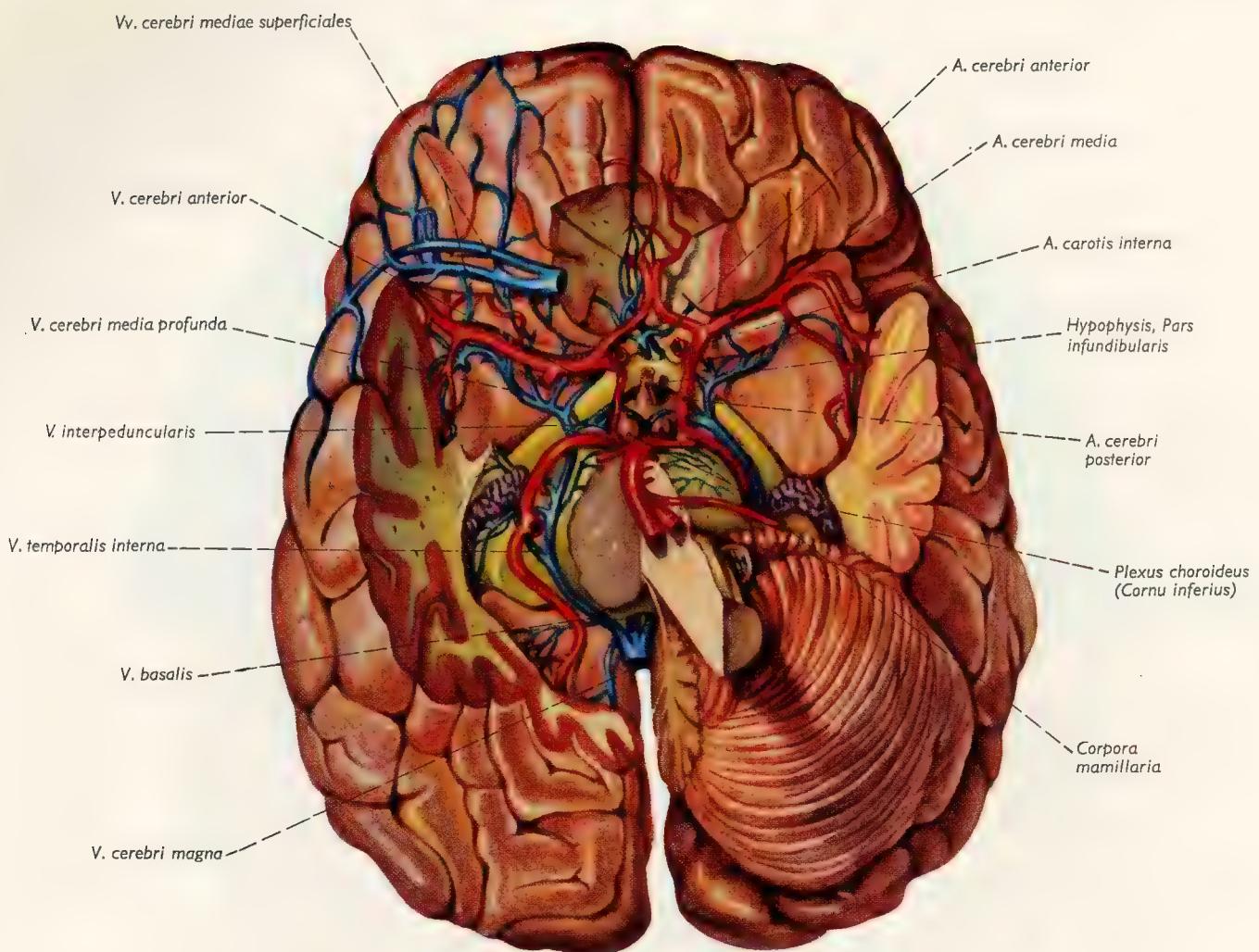
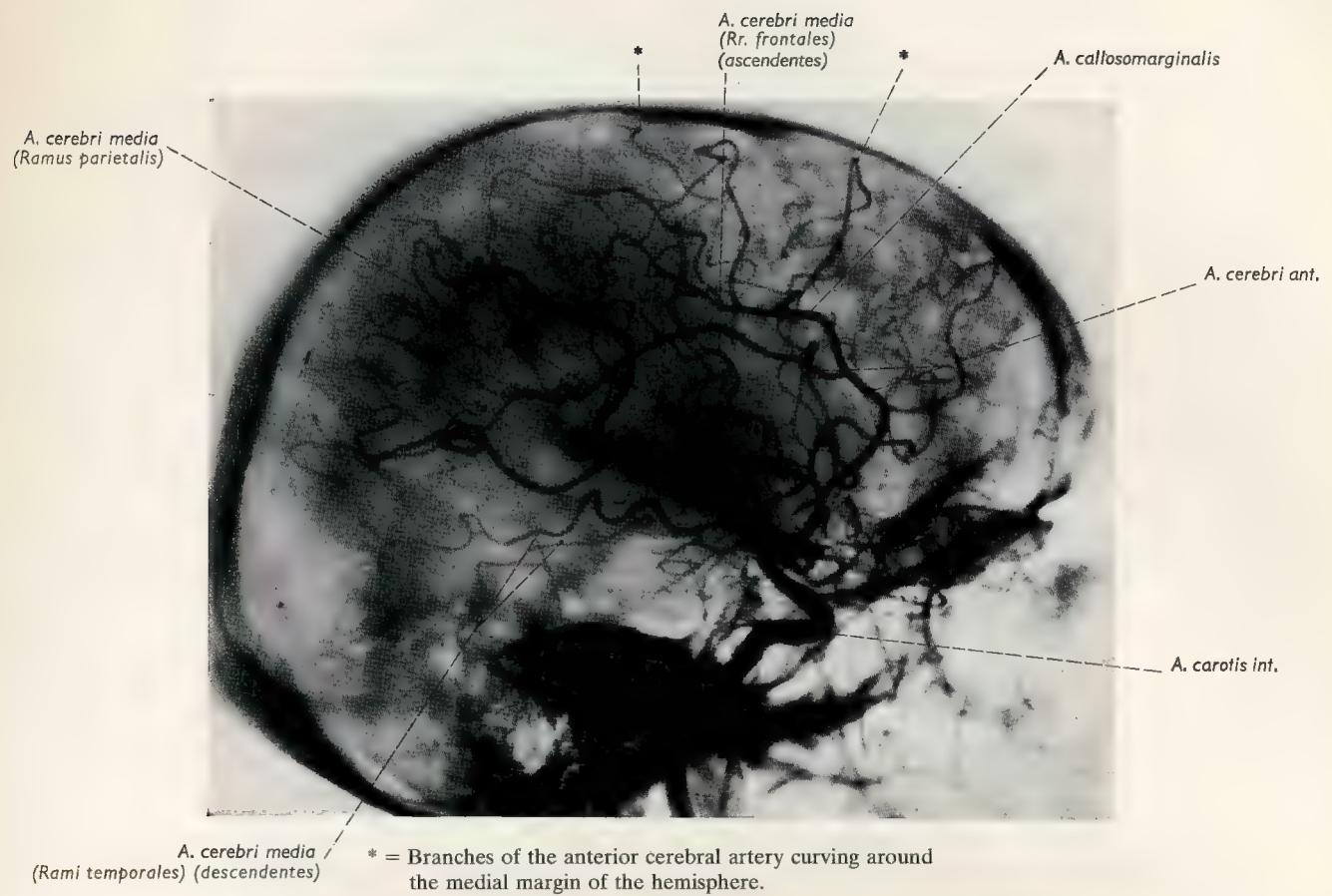


Fig. 73. The basal vein on the inferior surface of the brain with its anastomoses and tributaries. Part of the drainage pattern of the basal vein is in the form of a circulus venosus in the region of the chiasm, formed by connections between the anterior cerebral, the middle (deep) cerebral and the interpeduncular veins. The vein that drains the deep portion of the inferior horn (left side of the picture) is called the "internal temporal vein." Note also the superficial middle cerebral vein (drawn by K. Endtresser from an illustration in Ferner/Kautzky in: Handbuch der Neurochirurgie, Vol. 1, Berlin-Heidelberg-New York, 1959).



A. cerebri media (Rami temporales) (descendentes)

* = Branches of the anterior cerebral artery curving around the medial margin of the hemisphere.

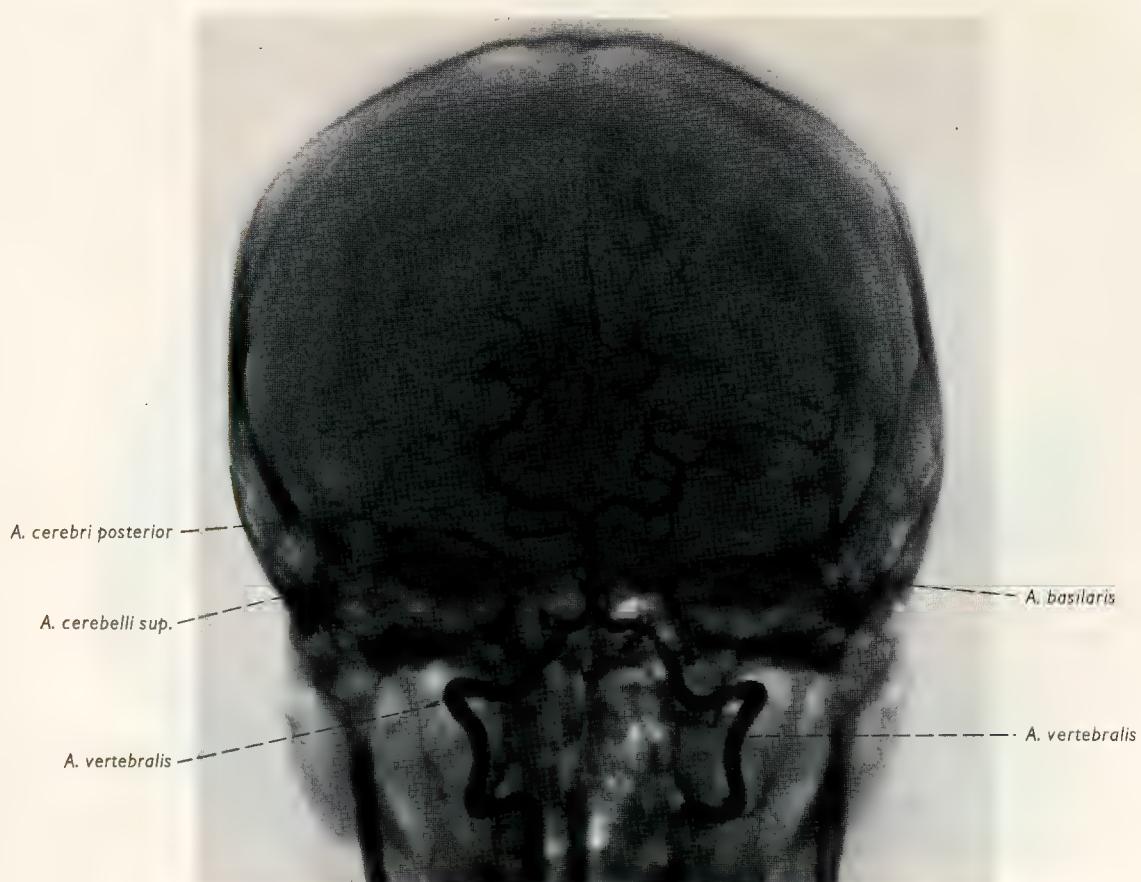


Fig. 74. (Top) Normal internal carotid arteriogram, lateral view
(R. Kautzky, Div. of Neurosurgery, University of Hamburg).

Fig. 75. (Bottom) Frontooccipital vertebral arteriogram
(R. Kautzky, Div. of Neurosurgery, University of Hamburg).

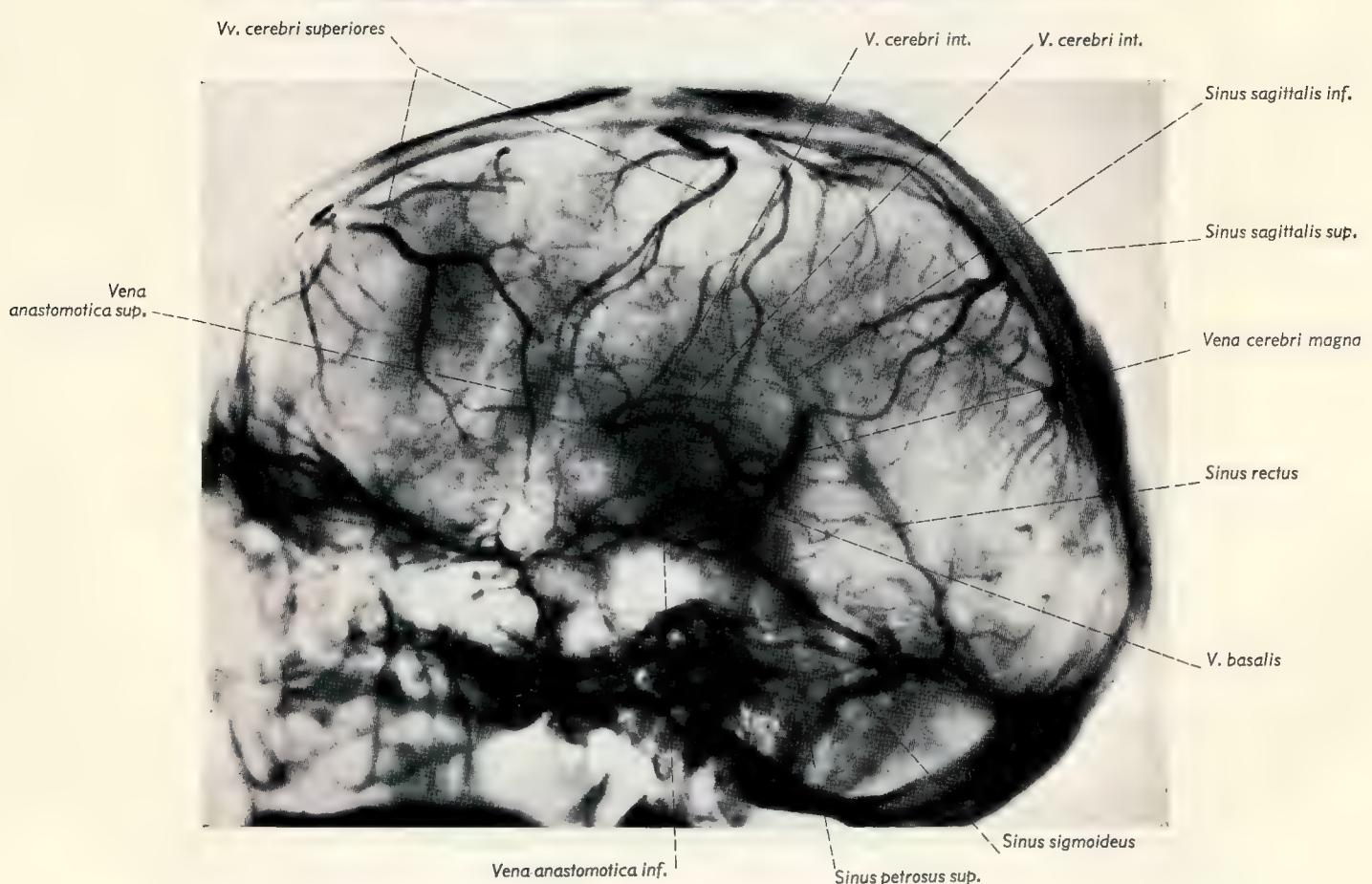
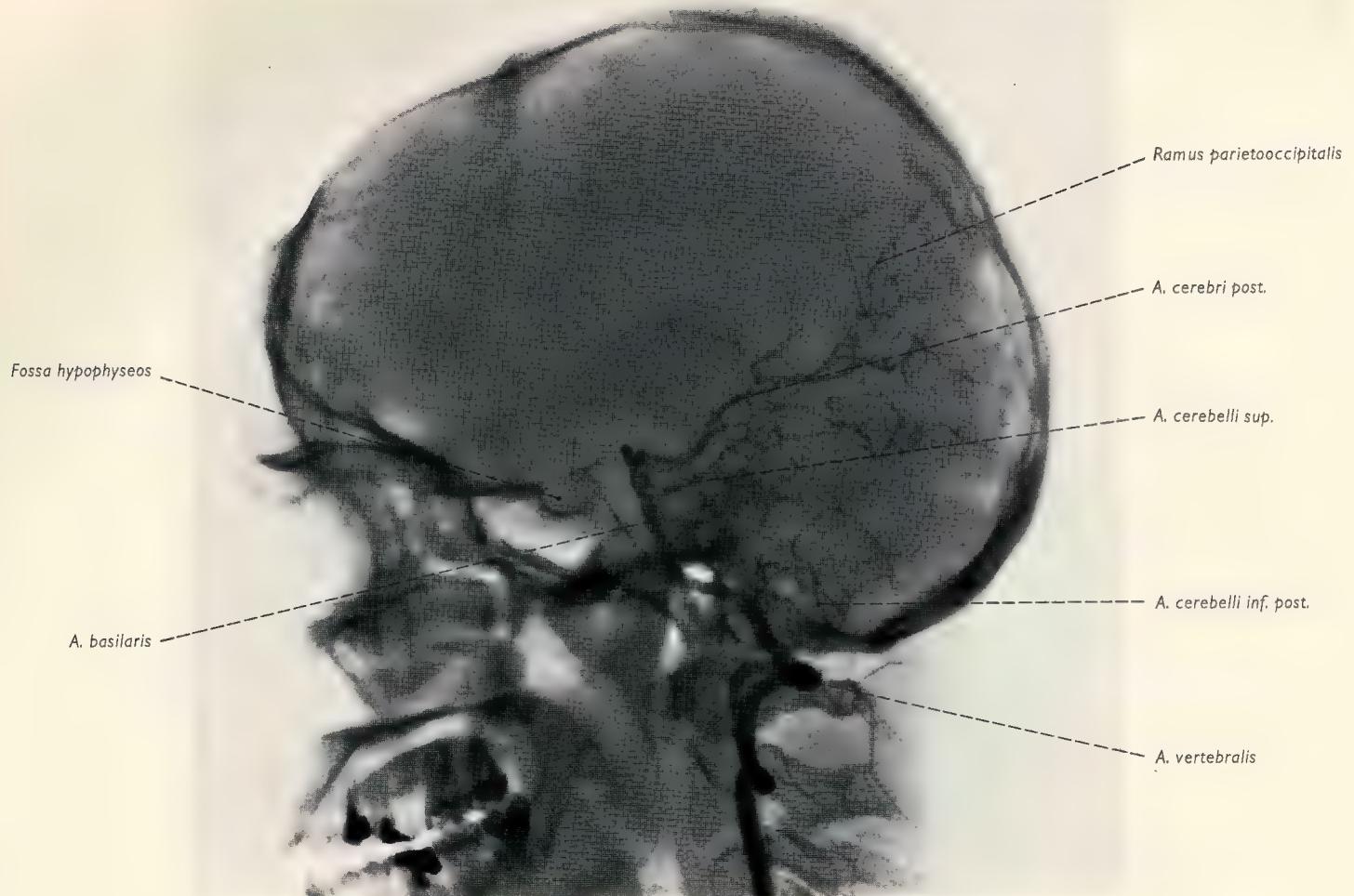


Fig. 76. (Top) Normal vertebral arteriogram, lateral view (from Kautzky/Zülch in: Neurologisch-neurochirurgische Röntgendiagnostik, Berlin-Heidelberg-New York, 1955).

Fig. 77. (Bottom) Late phlebogram, lateral view (from Kautzky/Zülch in: Neurologisch-neurochirurgische Röntgendiagnostik, Springer, Berlin-Heidelberg-New York, 1955).

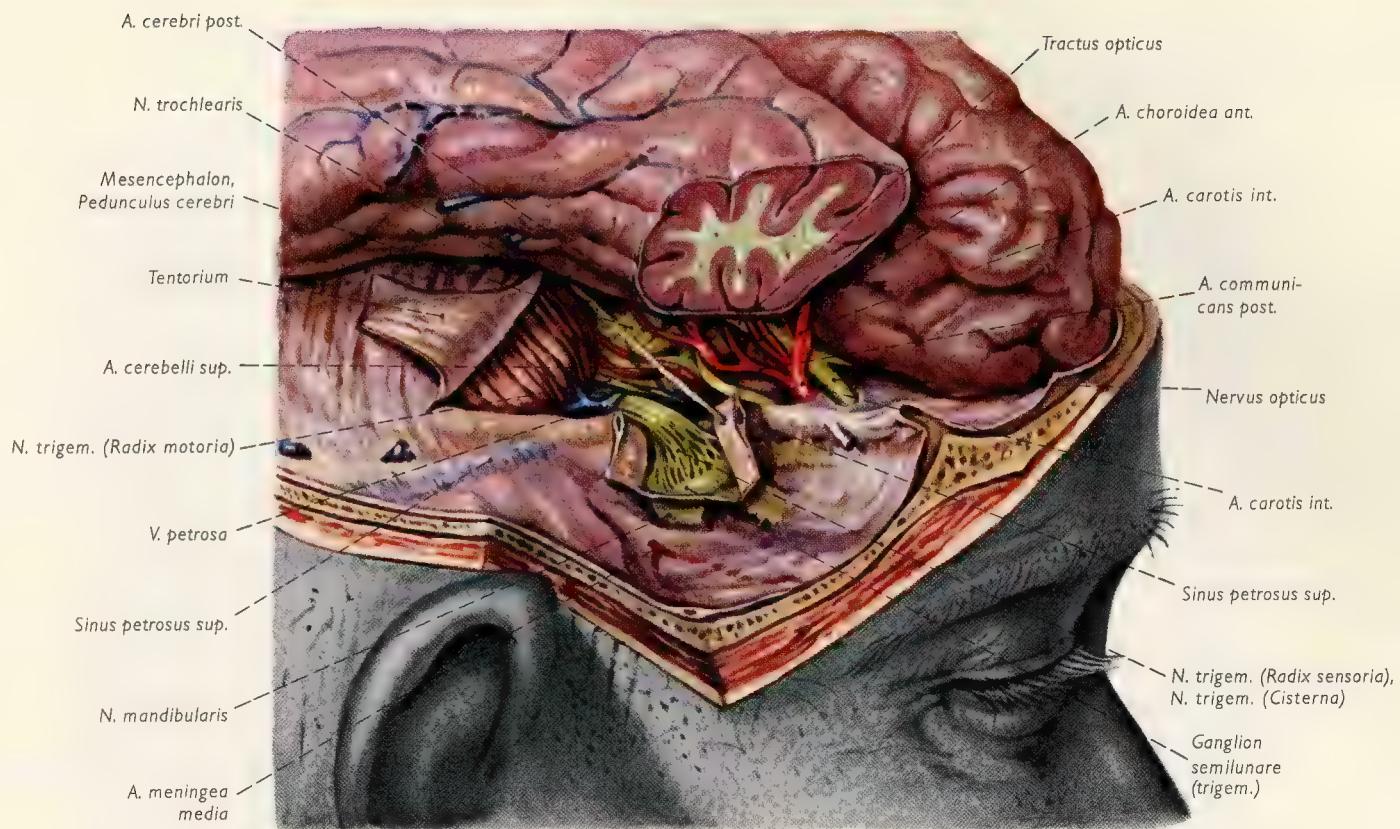


Fig. 78. Lateral view of the midbrain and the cerebral arterial circle after elevation of the temporal lobe. By reflecting back a portion of the tentorium and opening the dural trigeminal pocket, it is possible to see the rostral end of pons, the right brachium pontis with the root of the trigeminal nerve (portio major and minor) and also the relationship of the trigeminal root to the semilunar ganglion. By opening the dural trigeminal pocket, the superior petrosal sinus is transected because of its course over the trigeminal nerve. The superior petrosal sinus receives, immediately posterior to the trigeminal nerve, a vein from the cerebellum (petrosal v.) into which opens the basal vein from the front (frequent variation). The petrosal vein runs between the sensory and motor roots of the trigeminal nerve. The anterior cerebral artery is seen originating above the chiasm (drawn by K. Endtresser from an illustration in Ferner/Kautzky, in: Handbuch der Neurochirurgie, Vol. 1, Berlin–Heidelberg–New York, 1959).

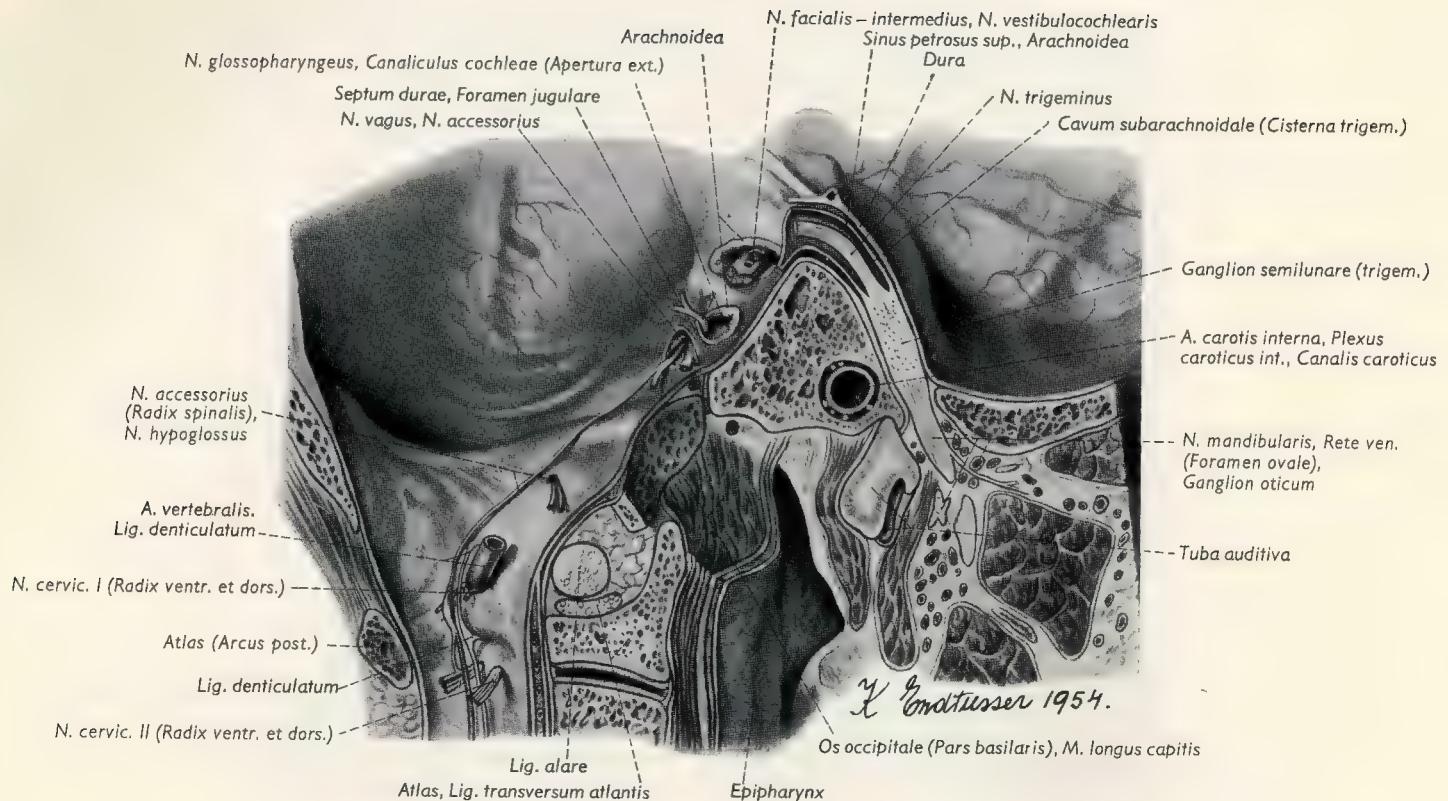


Fig. 79. Section through the base of the skull showing the left cavum trigeminale (Meckel's cavity) and the trigeminal cistern. The plane of this section is left parasagittal in the area of the vertebral canal, then becomes oblique pointing laterally, and near Meckel's cavity is at right angle to the axis of the pyramid.

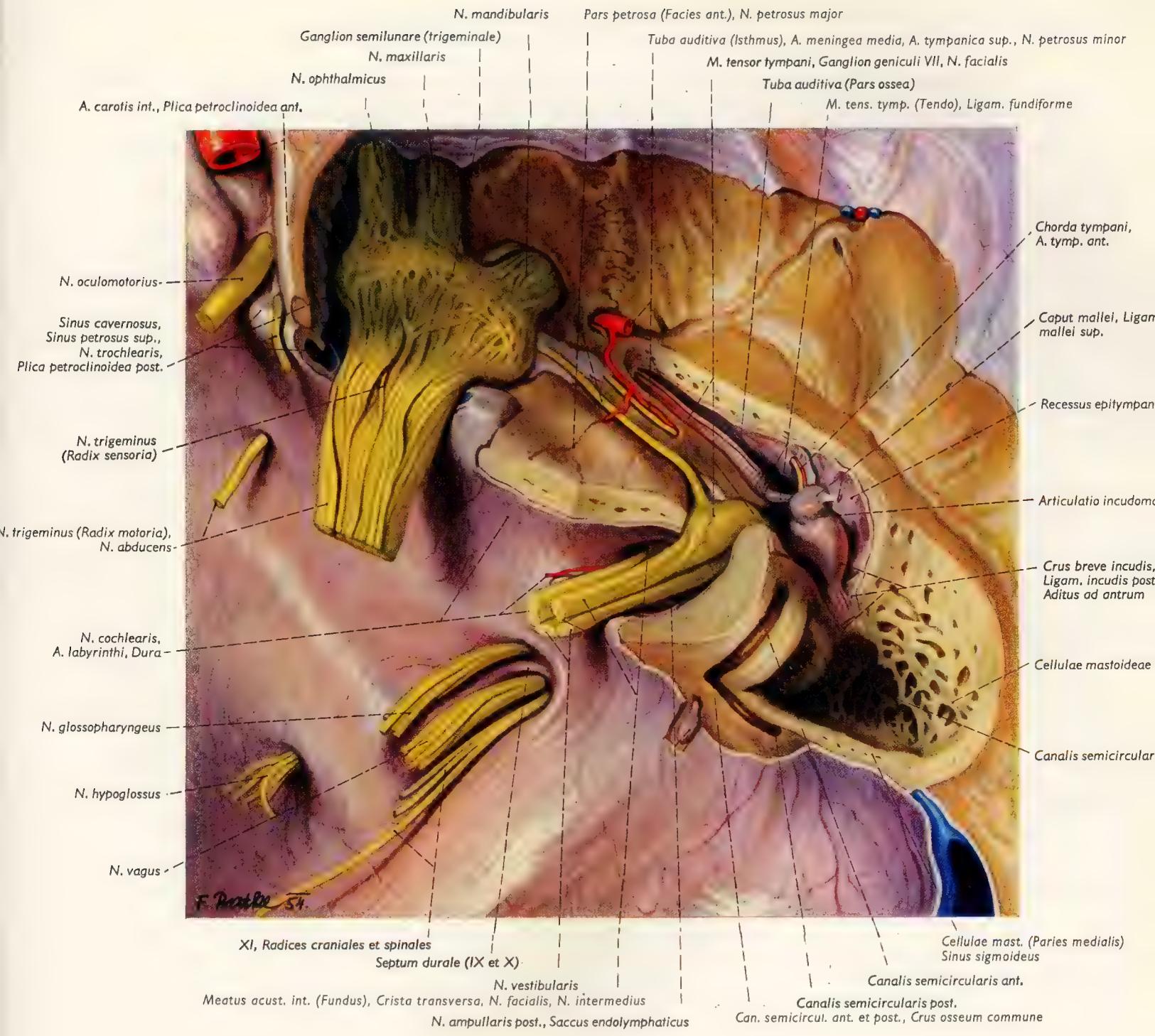


Fig. 80. Area of the semilunar ganglion (of Gasser) and the geniculate ganglion of the facial nerve.
View into the tympanic cavity after removal of tegmen tympani.

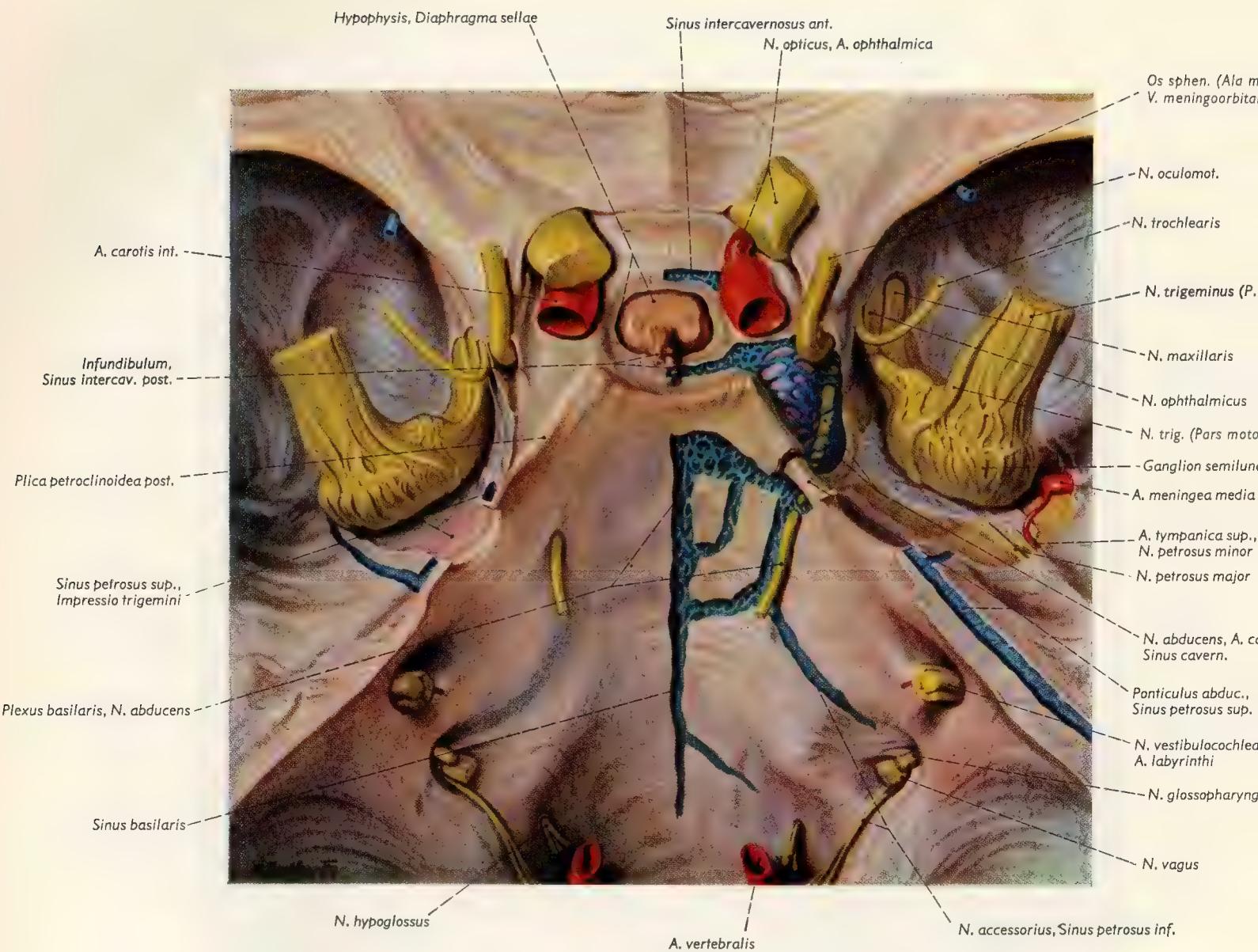
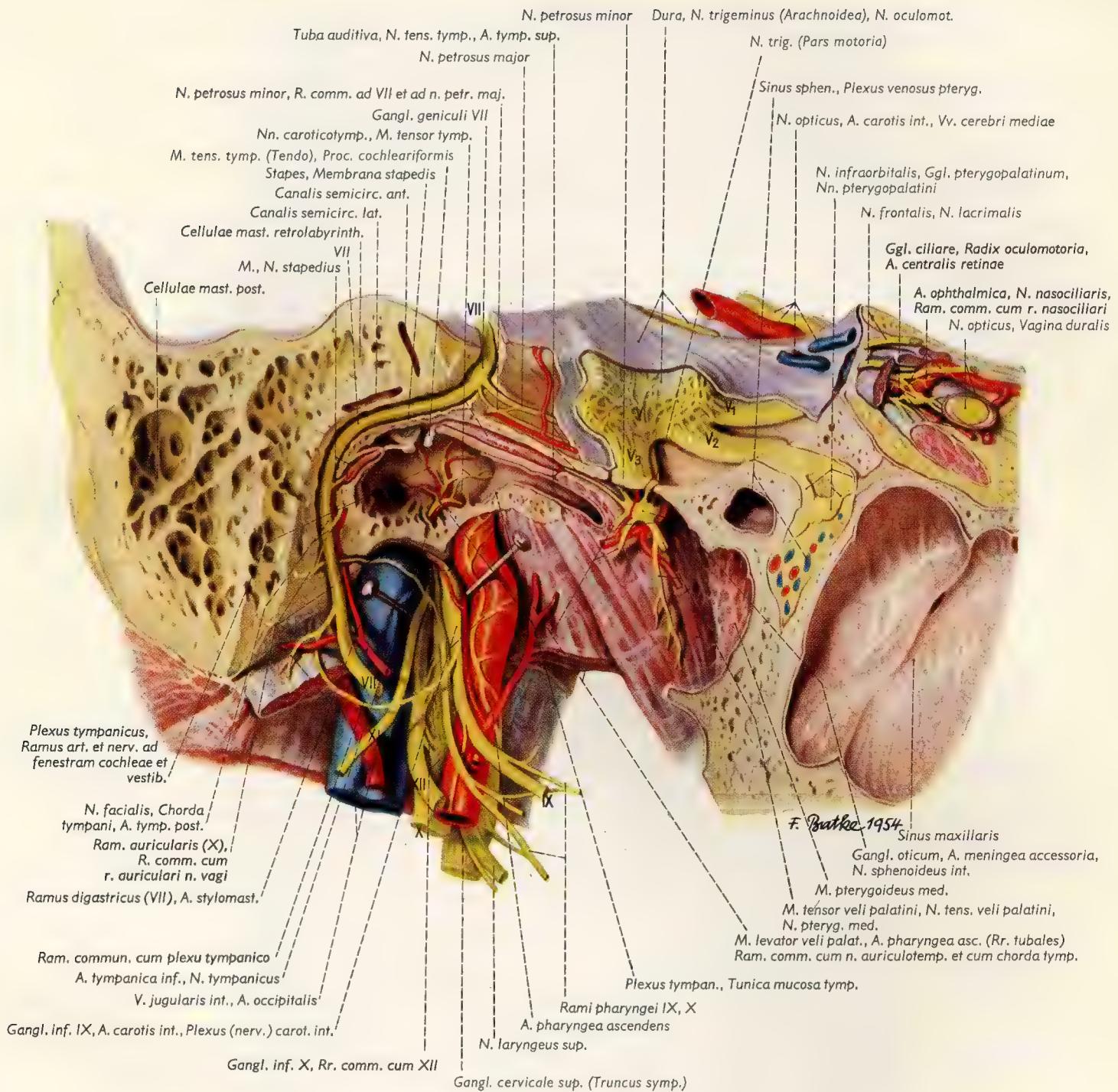


Fig. 81. Blood vessels and nerves in the middle portion of the skull base, particularly in the region of sella turcica.



V(1, 2, 3) = Ganglion semilunare (trigeminale),
 N. ophthalmicus, maxillaris,
 mandibularis
 VII = N. facialis

VII = N. facialis

IX = N. glossopharyngeus

X = N. vagus

XI = N. accessorius, R. ext.

XII = N. hypoglossus

Fig. 82. Lateral view of vessels and nerves of the right middle ear, on the medial wall of the tympanic cavity and in adjoining areas in front and behind. Structures in the middle cranial and infratemporal fossae; exposure of the cervical neurovascular bundle. Lateral view of the opened facial canal, the anterior and lateral semicircular canals and the musculotubal canal. The auditory part of the skull has been cut in an oblique-sagittal plane extending medially from the eardrum, so that the stirrup remains in contact with the medial wall of the tympanic cavity.

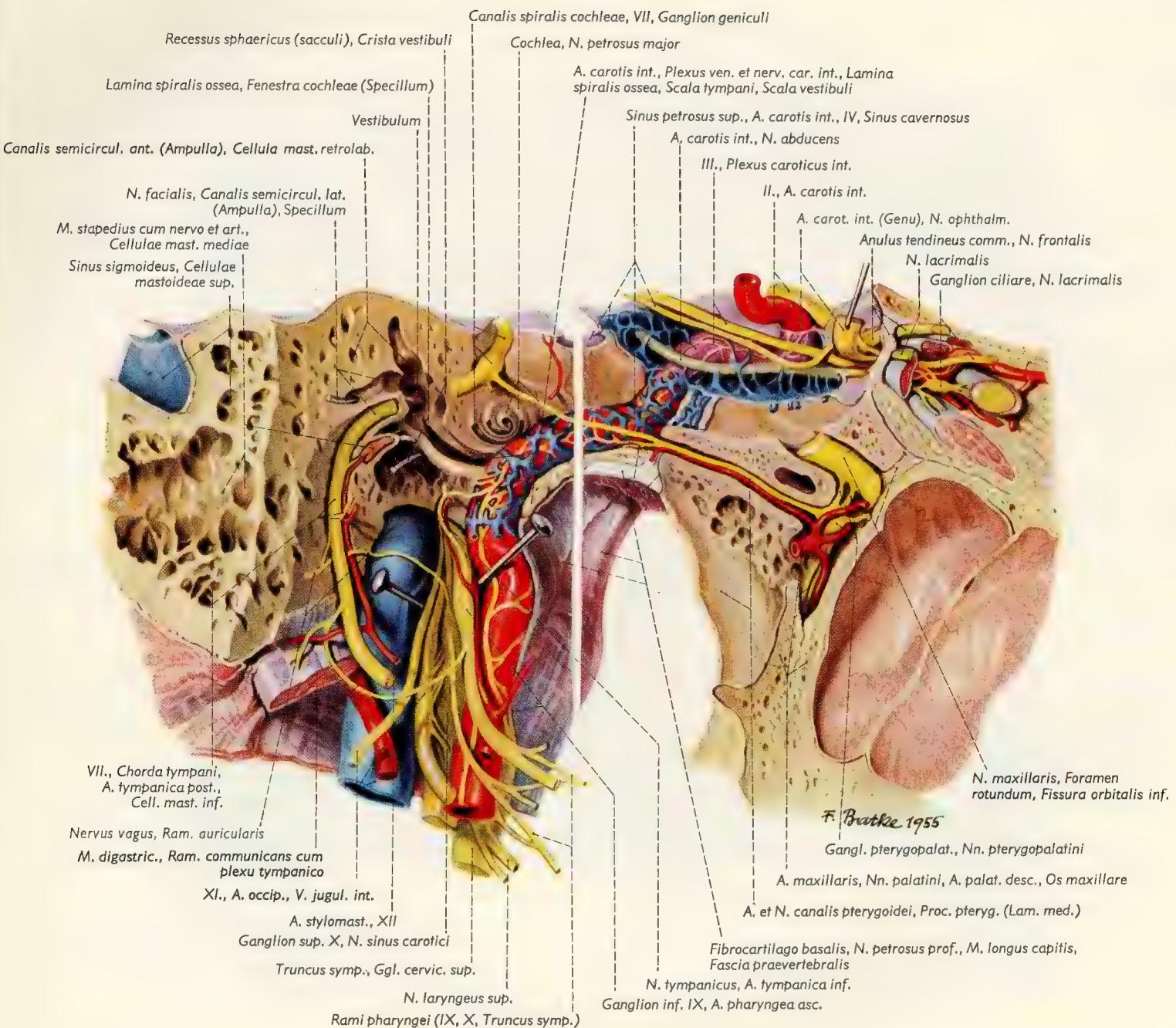


Fig. 83. Vertical section through the petrosal bone along the axis of the pyramid. Opened inner ear, facial canal, mastoid air cells, carotid canal, superior orbital fissure and foramen rotundum. Course of the internal carotid artery through the petrosal bone.

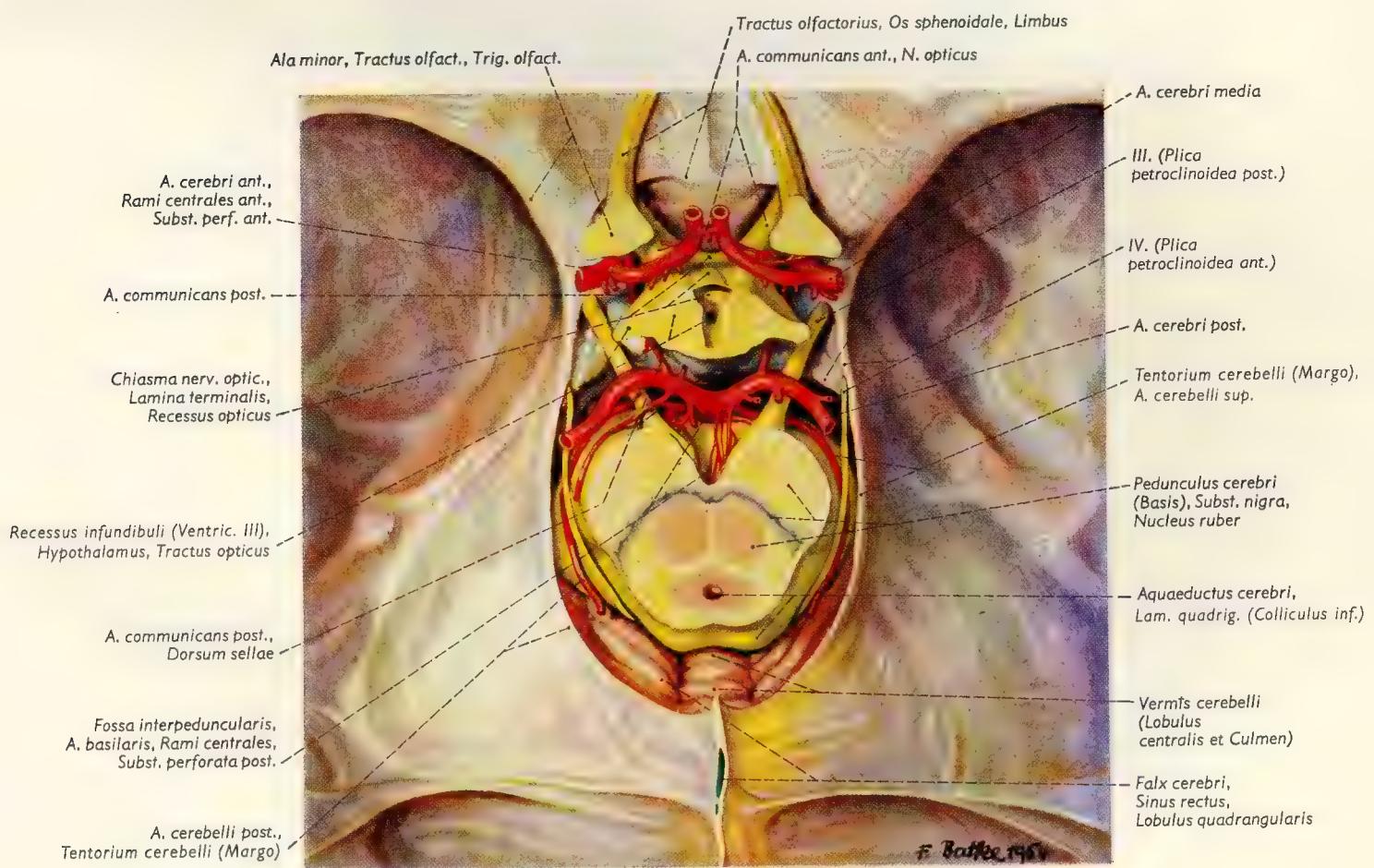
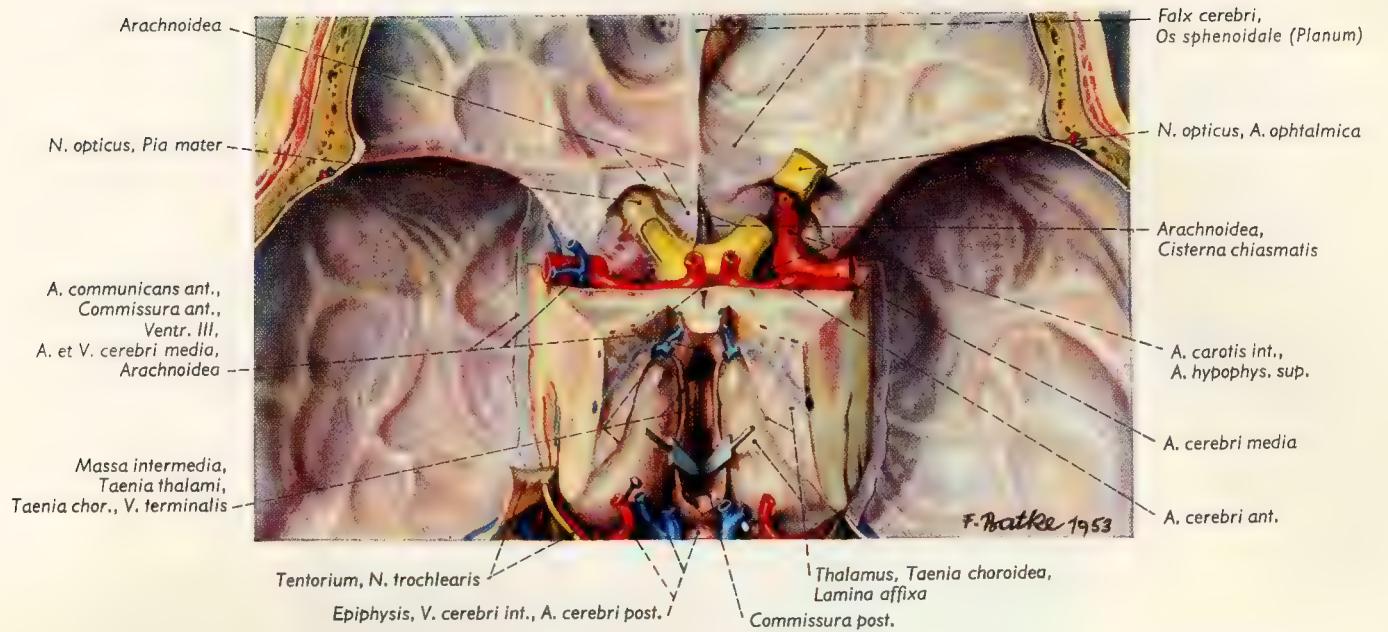


Fig. 84. (Top) Region of the optic chiasm, diencephalon from above, anterior and middle cranial fossae.

Fig. 85. (Bottom) Cross section of mesencephalon viewed through the tentorial notch from above. Region of optic chiasm, cerebral arterial circle.

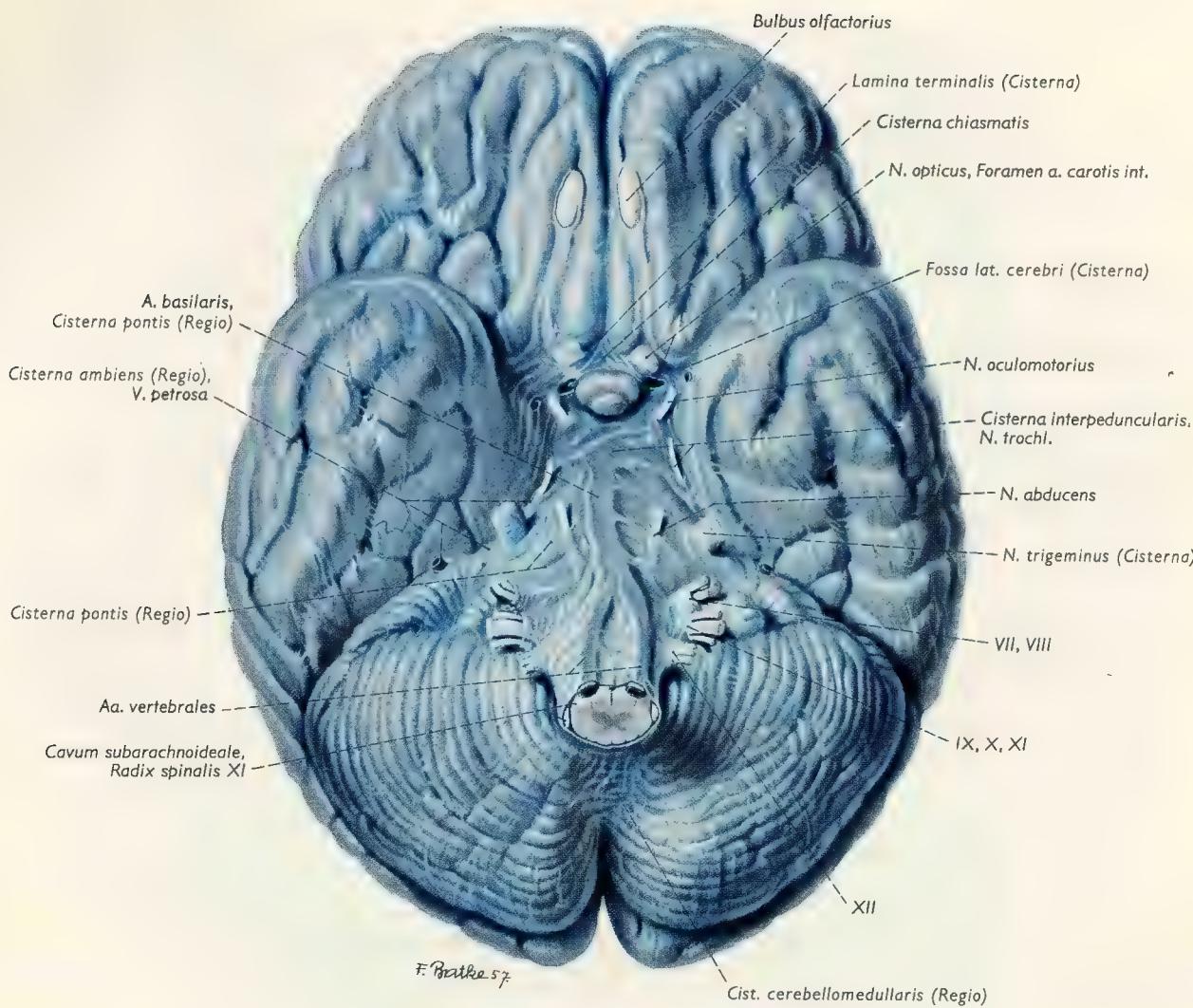


Fig. 86. The arachnoid and subarachnoid space on the inferior aspect of the brain. Note the openings for passage of blood vessels and cranial nerves.

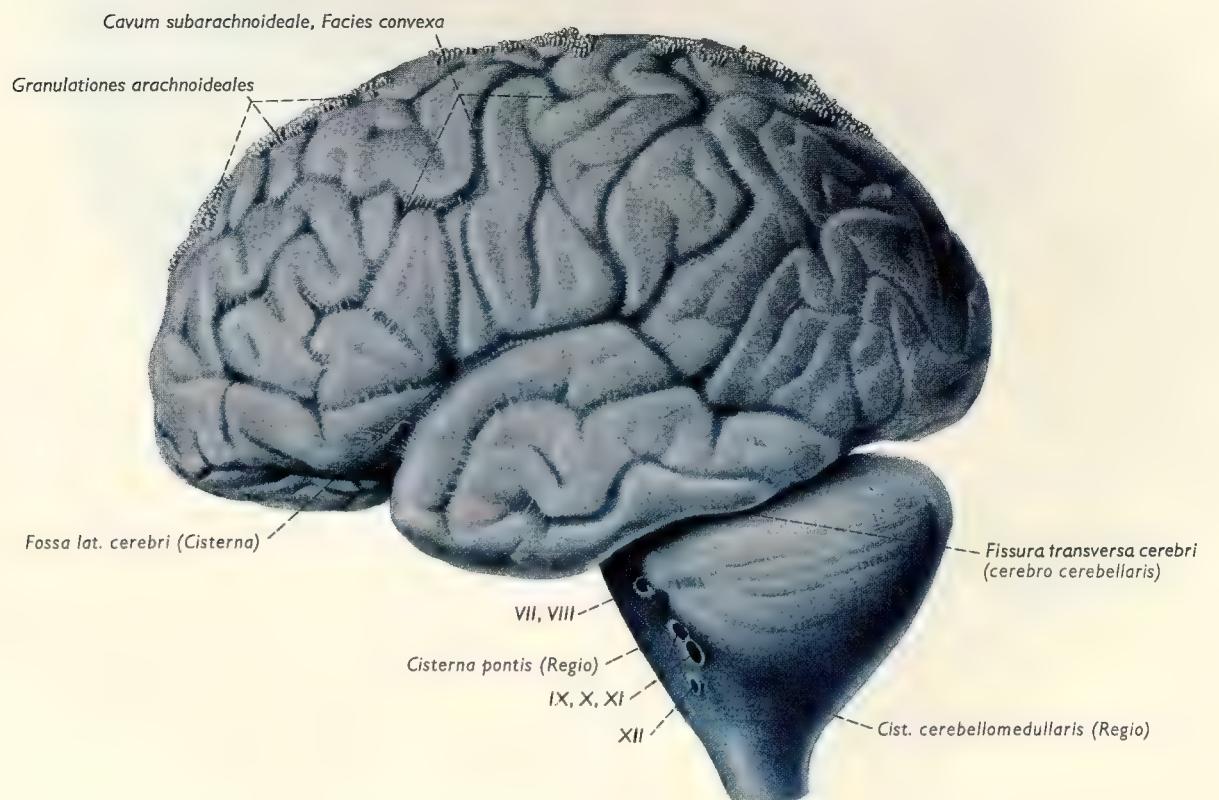
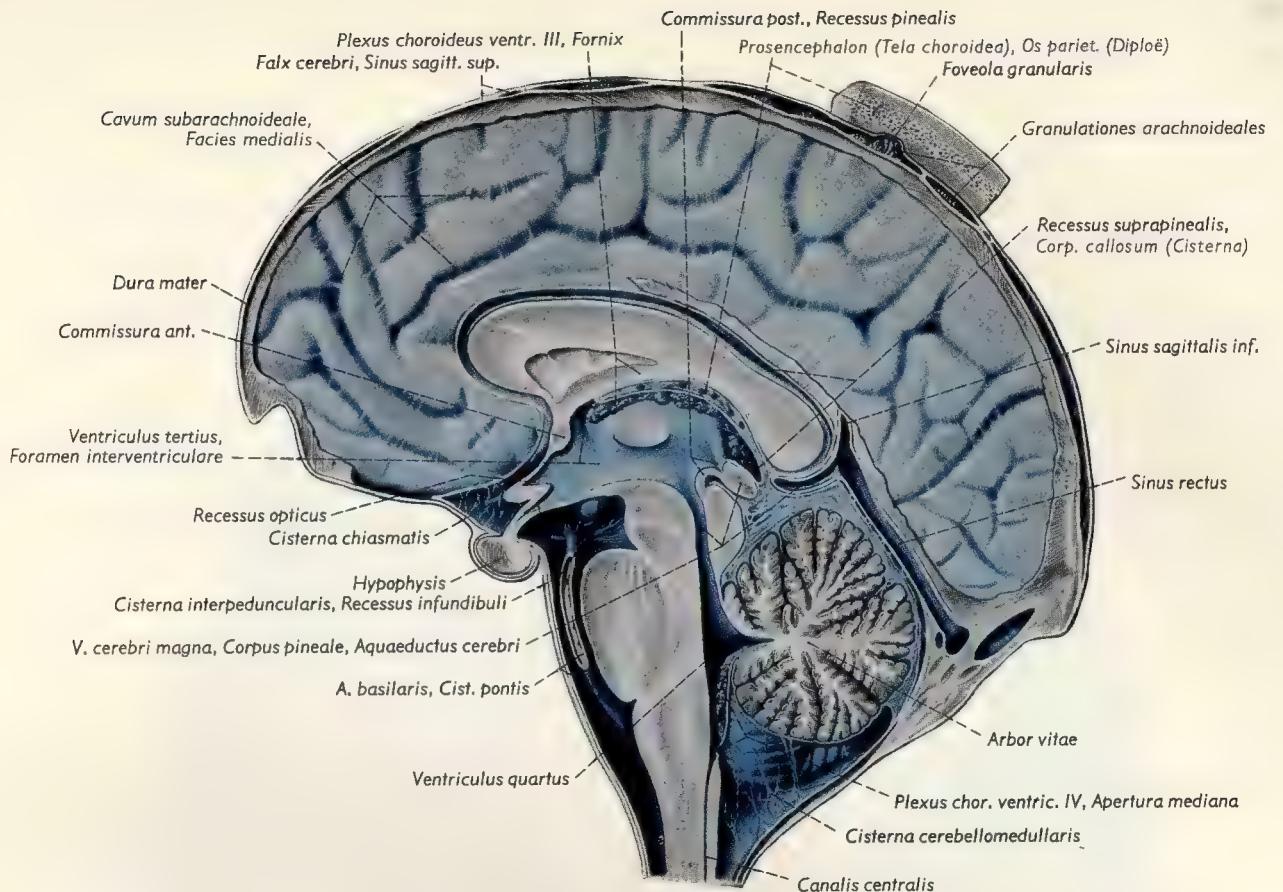


Fig. 87. (Top) The arachnoid and the subarachnoid space; particularly the cisterns, in median section (semischematic). Fluid-filled spaces are colored blue. Blood vessels are included only where they have a specific relationship to the cisterns.

Fig. 88. (Bottom) Lateral view of the arachnoid, the subarachnoid space and the cisterns of the brain (semischematic). Fluid-filled spaces are colored blue.



Fig. 89. Superior surface of the cerebral hemisphere after removal of the meninges. Only falx cerebri remains in the longitudinal cerebral fissure. Note, by comparing with Fig. 90, the individual differences in the development of the convolutions and sulci. The identification of a person based on this pattern would be just as accurate as using a fingerprint (dactyloscopy) (prepared by Vieder).

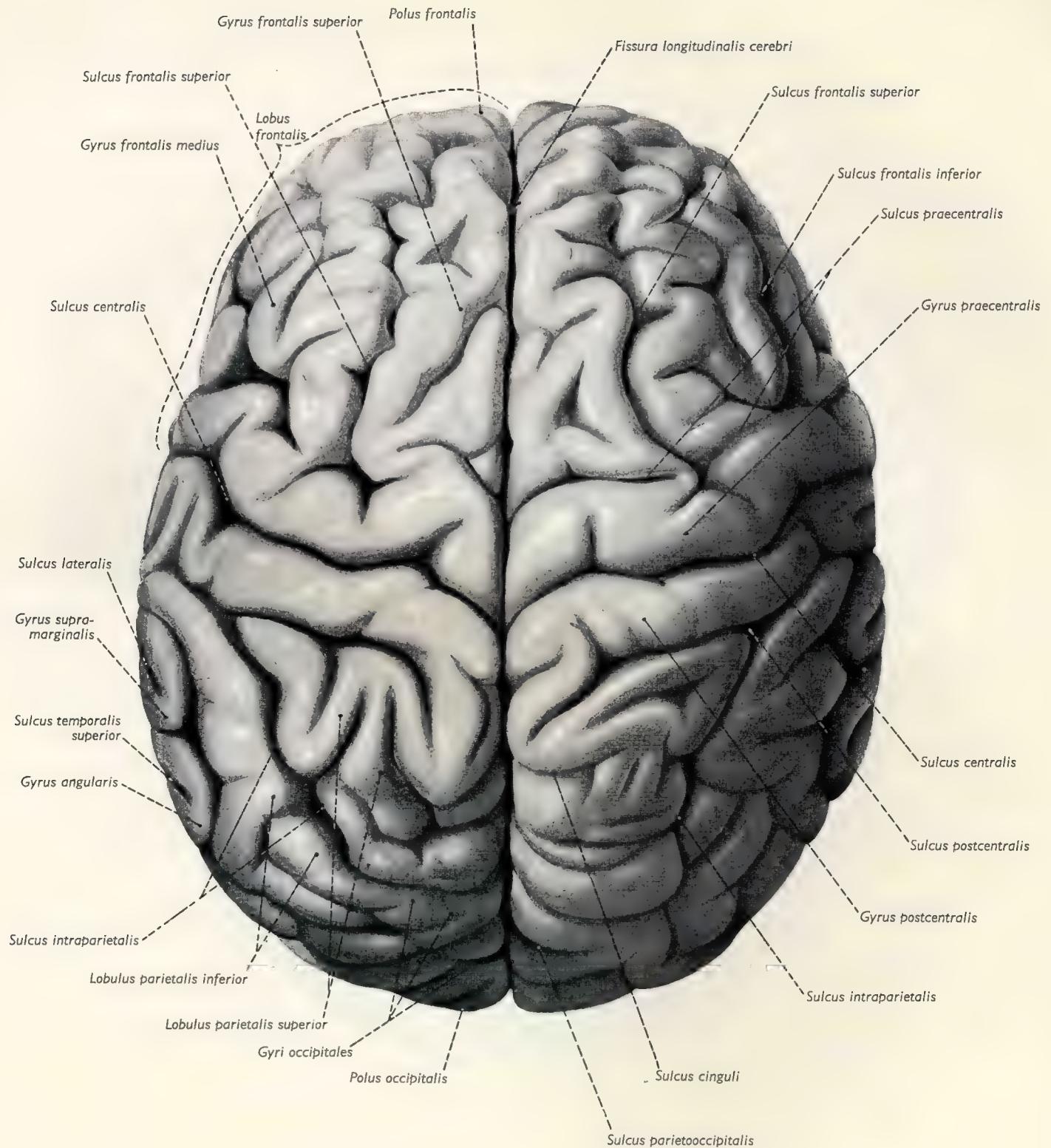


Fig. 90. Cerebral hemisphere after removal of the leptomeninges. Seen from above
(from Sobotta/Becher).

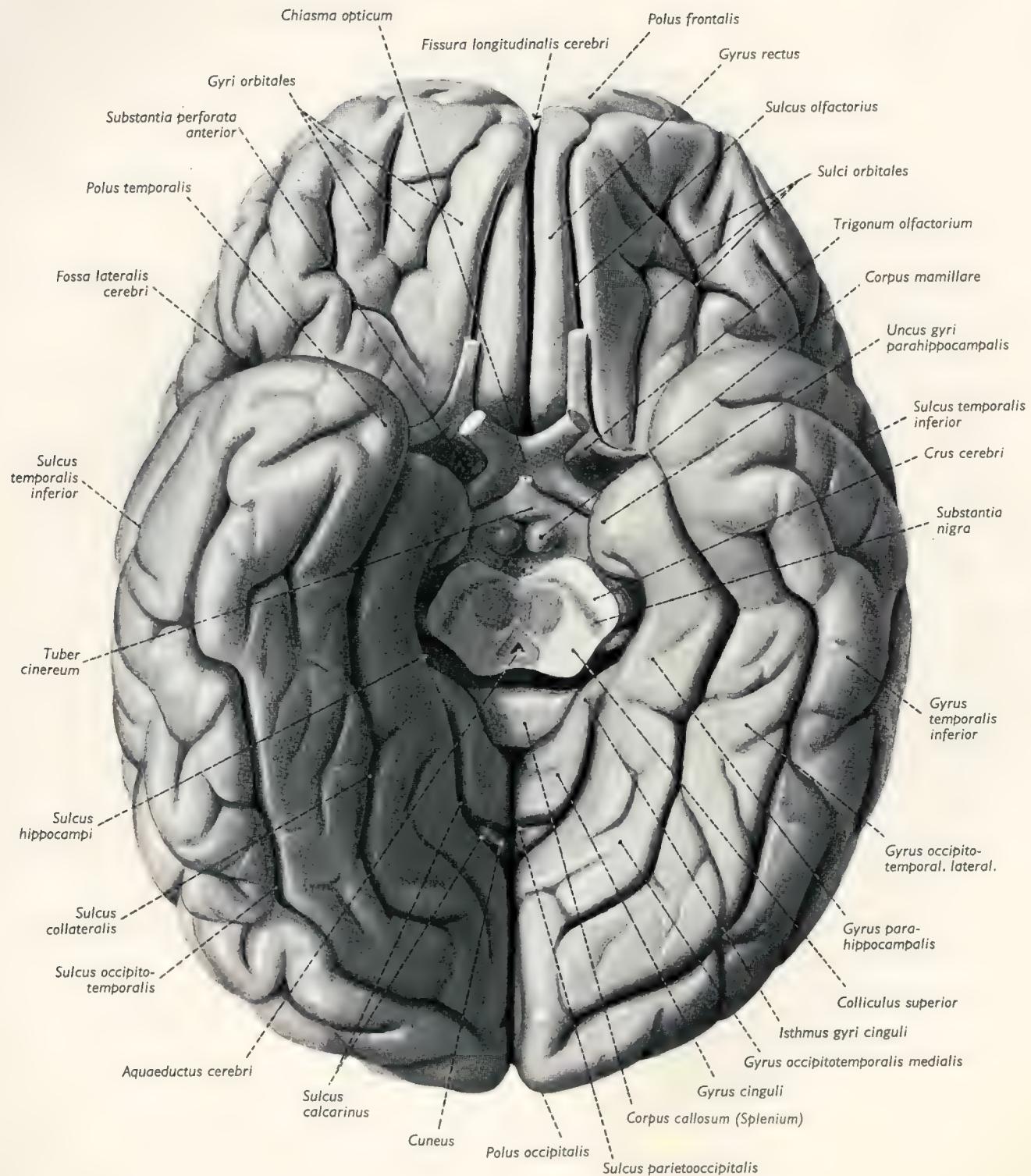


Fig. 91. The cerebral hemisphere after removal of the leptomeninges. Seen from below. The brain stem and cerebellum have been removed by a section through the midbrain. The red nucleus is seen bilaterally under substantia nigra on the cut surface of the midbrain (from Sobotta/Becher).

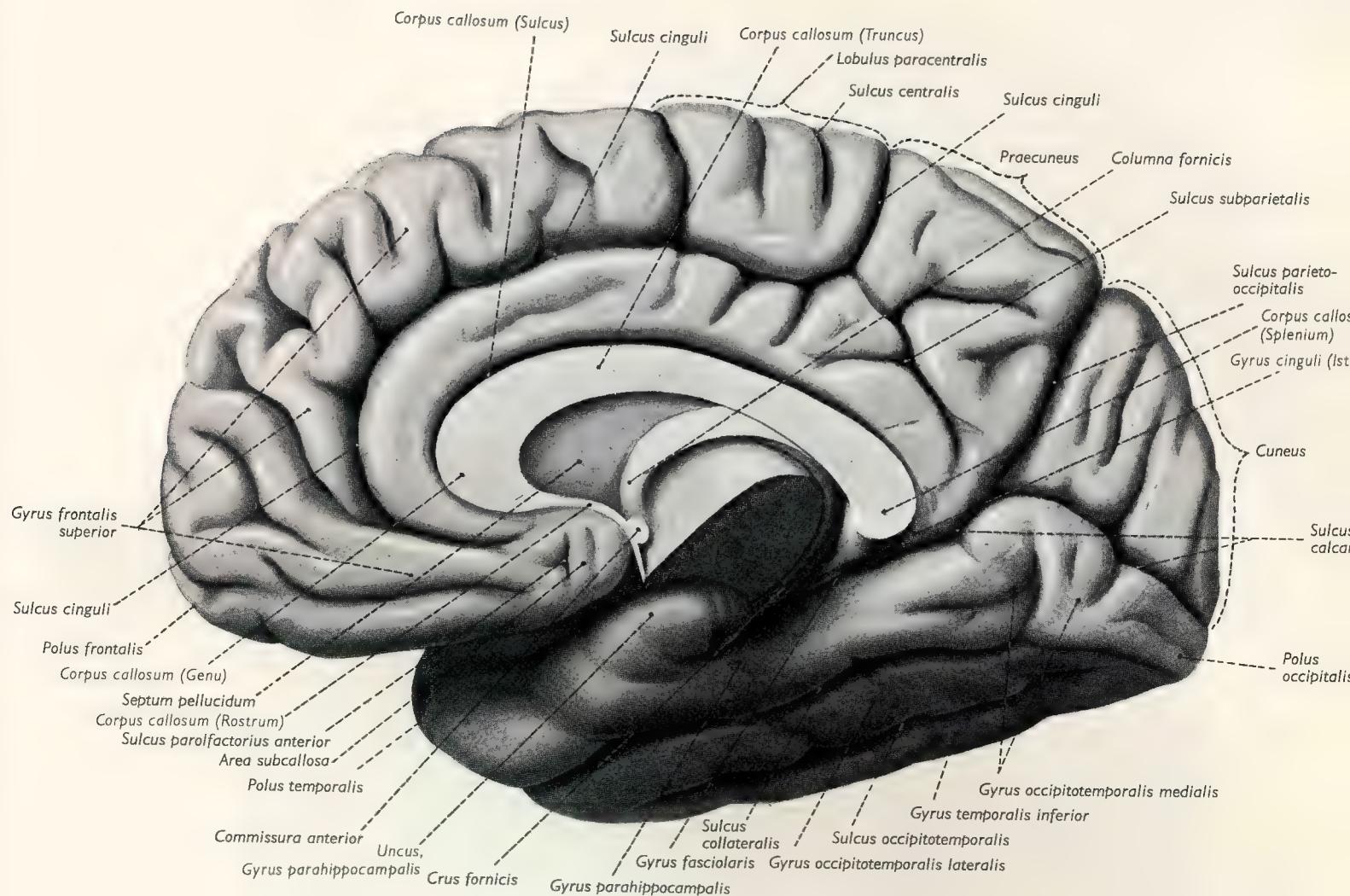


Fig. 92. Right cerebral hemisphere. The brain has been cut in the median plane, and the brain stem and cerebellum have been removed by an oblique section through the diencephalon. View of the medial and inferior surfaces of the hemisphere (from Sobotta/Becher).

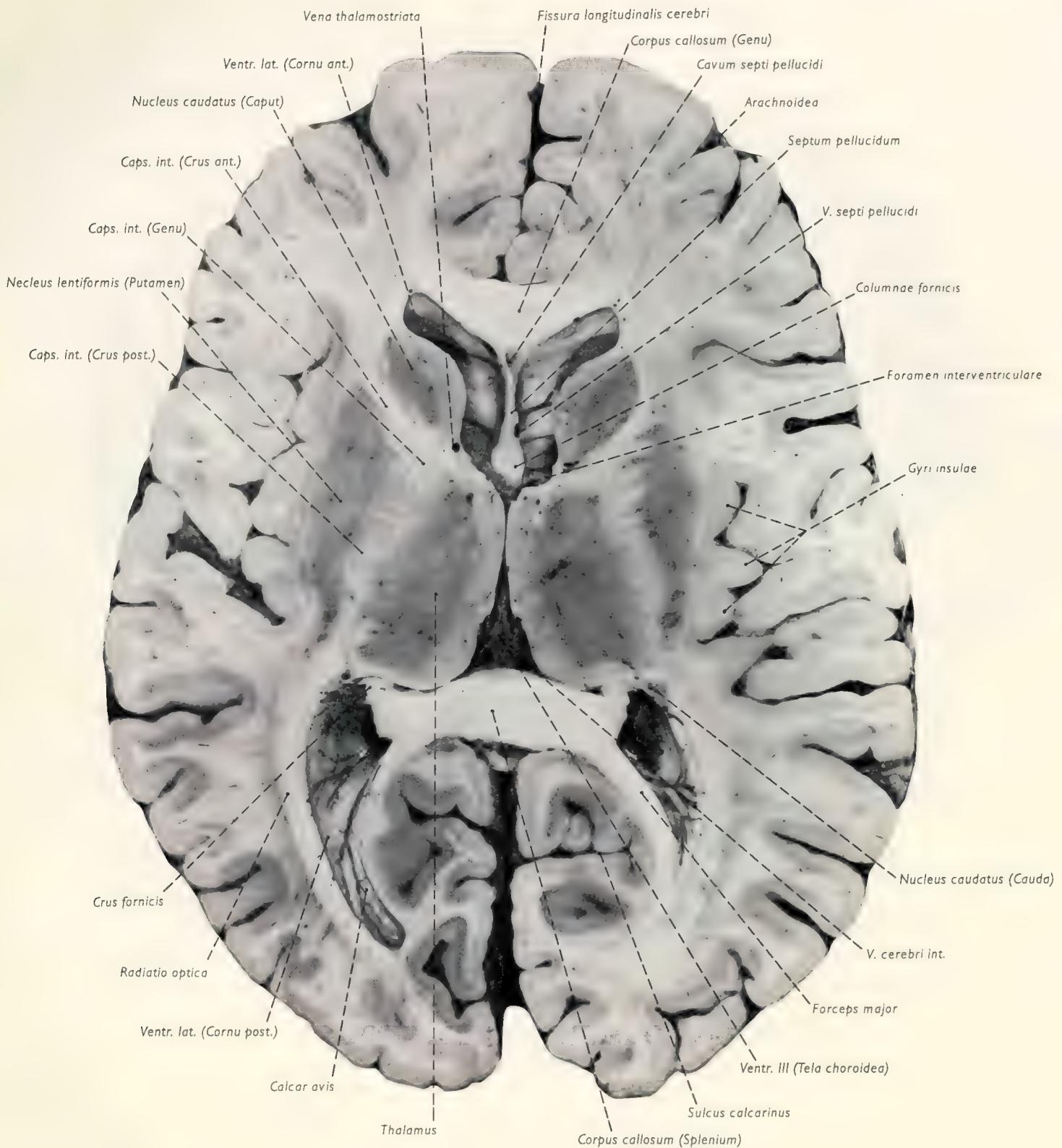


Fig. 93. Horizontal section through the brain, seen from below.

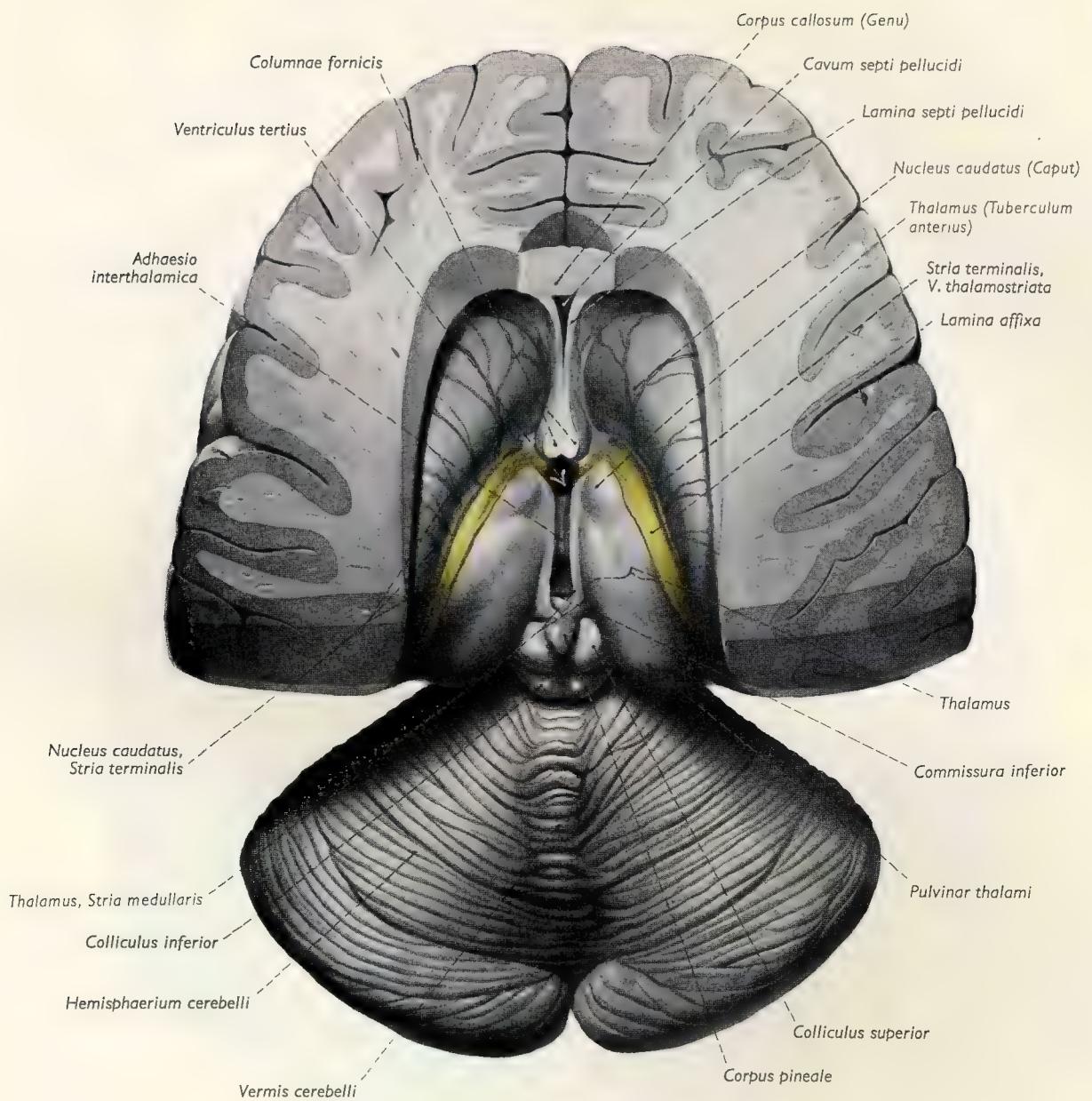


Fig. 94. Basal ganglia of the brain (thalamus and caudate nucleus), third ventricle, lamina quadrigemina and cerebellum seen from above. The columns of the fornix, the chorid lamina of the third ventricle and the temporal and occipital lobes of the hemisphere have been removed. The lamina affixa, which here is the extremely thin wall of the telencephalon, lies on the thalamus and is shown in yellow (from Sobotta/Becher).

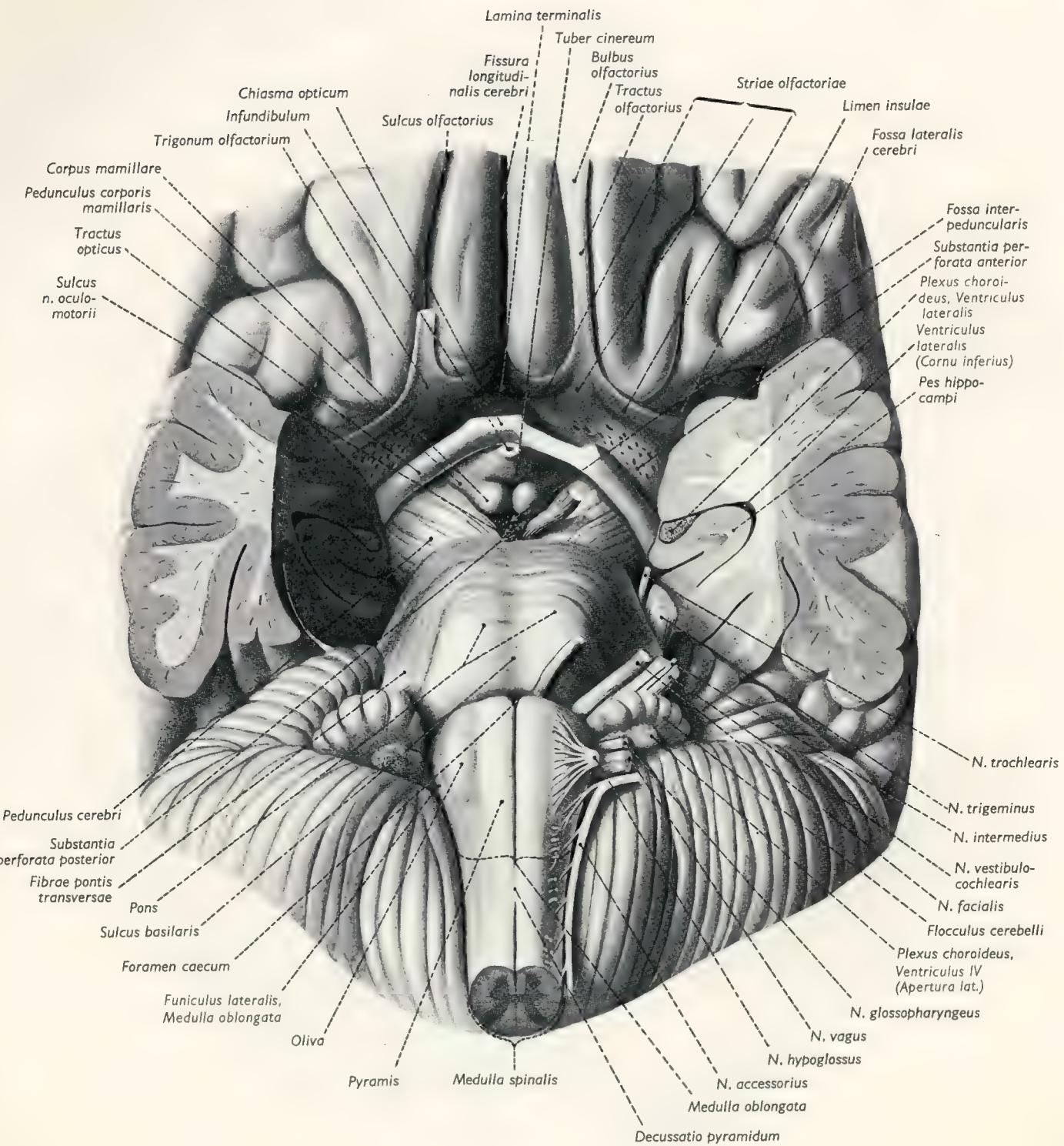


Fig. 95. Brain stem and associated structures of the brain seen from below: diencephalon, midbrain, pons, medulla oblongata (bulb). The temporal poles have been removed. The cranial nerves are retained on the left side and removed on the right. Slightly larger than natural size (from Sobotta/Becher).

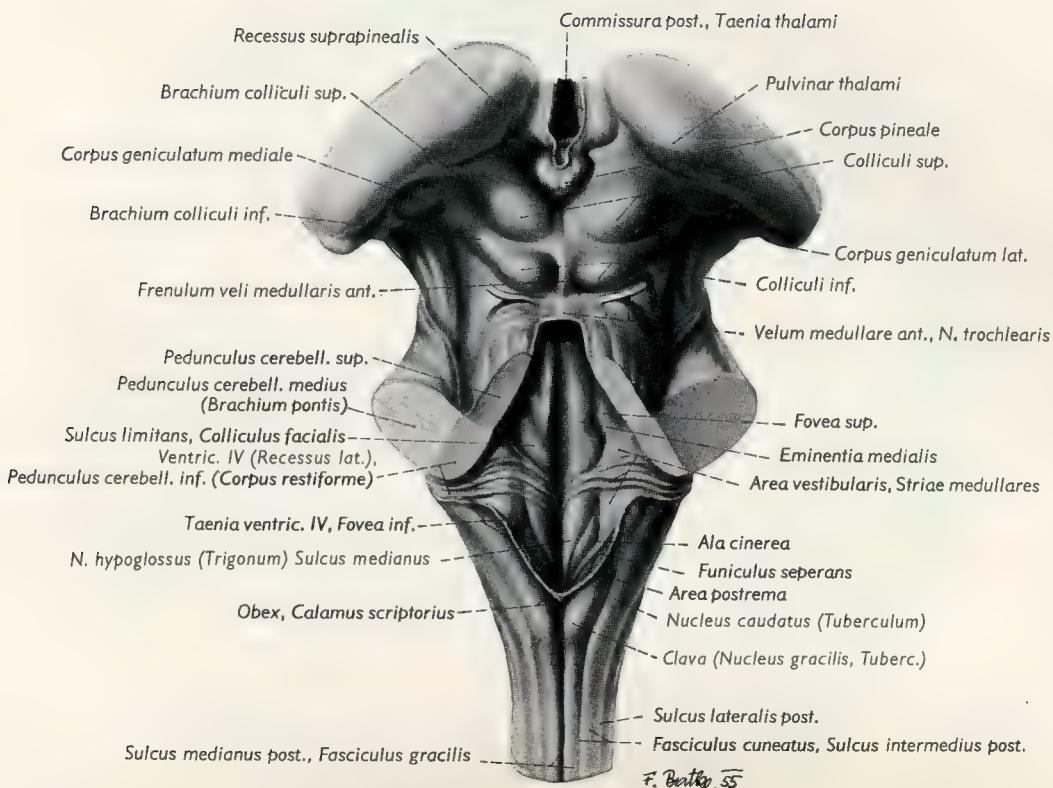


Fig. 96. (Top) Dorsal view of medulla oblongata, rhomboid fossa, cerebellar peduncles and lamina tecti after removal of cerebellum.

Fig. 97. (Bottom) Medulla oblongata, pons, midbrain and diencephalon (brain stem) seen from below.

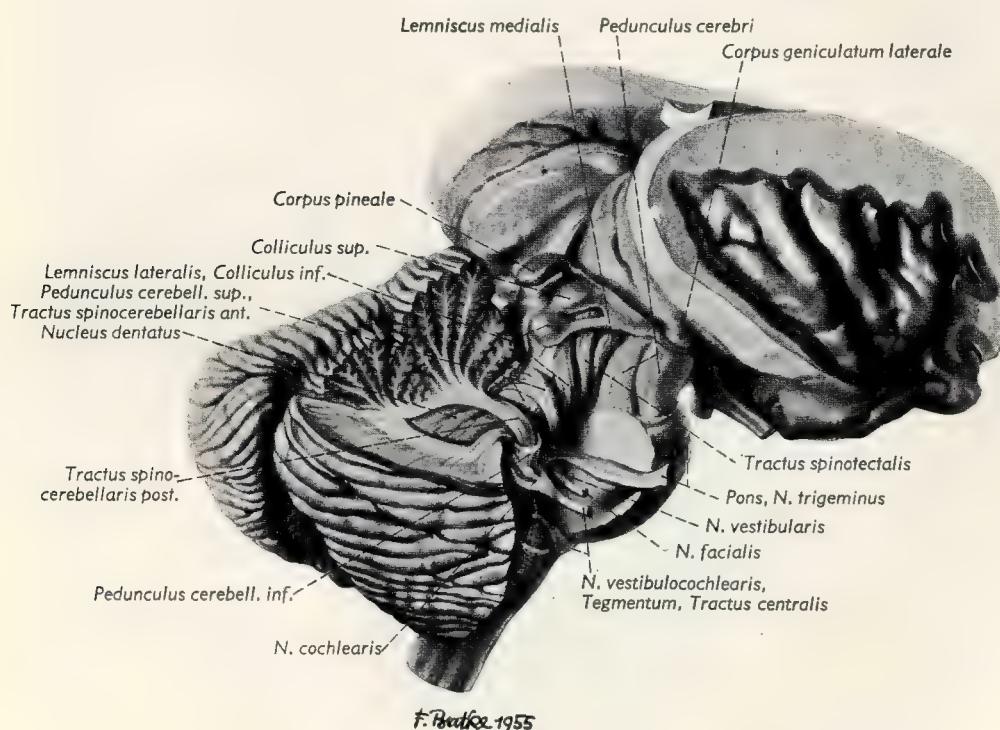
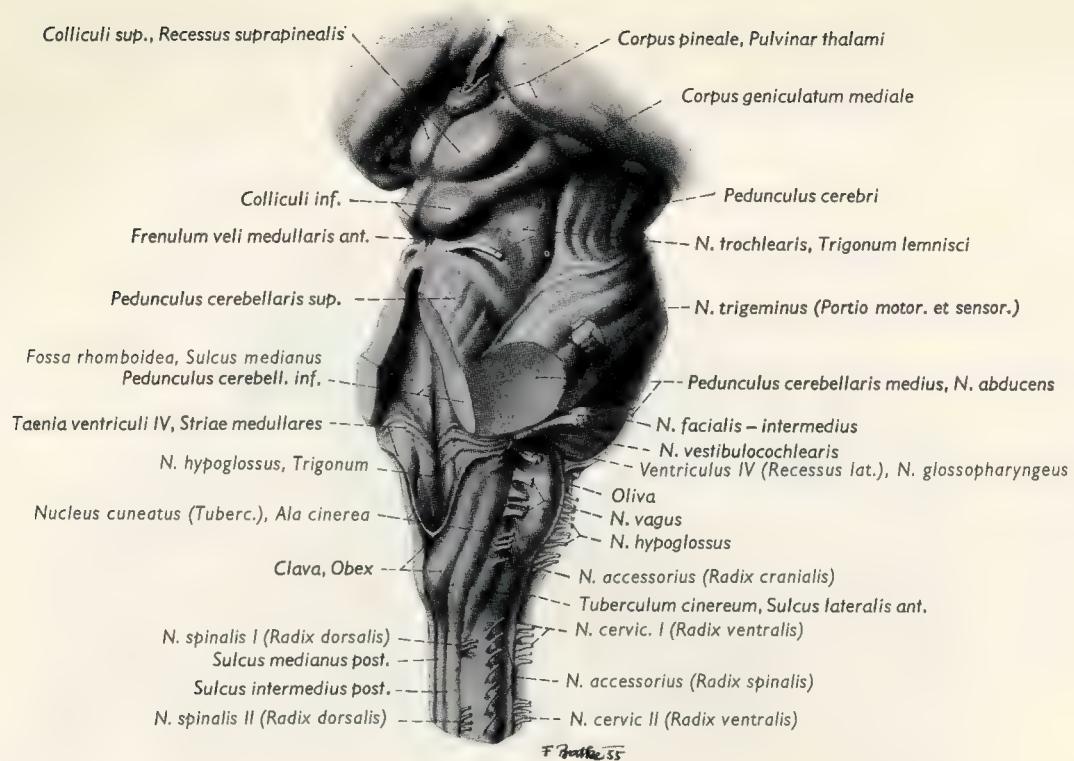
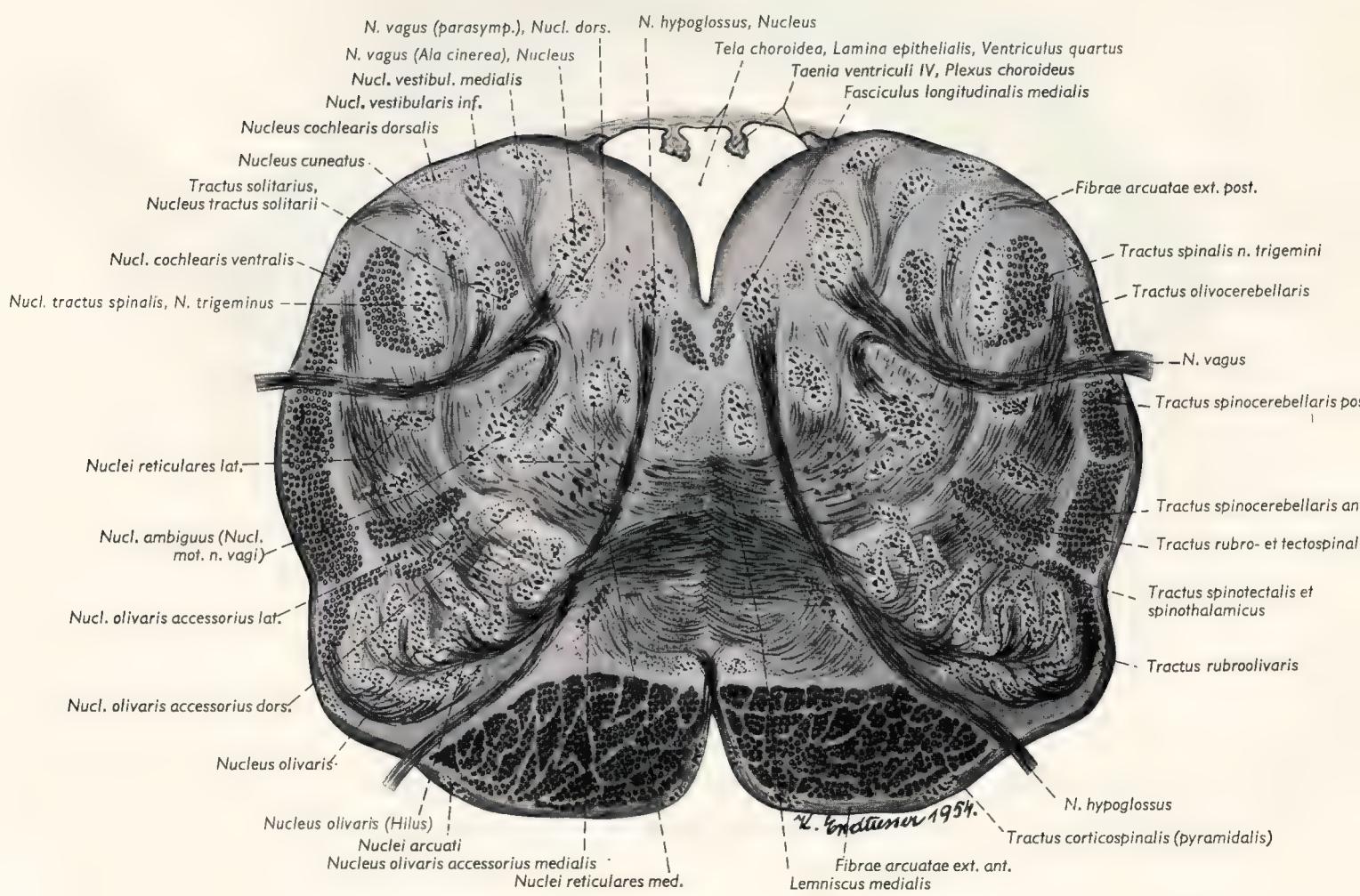
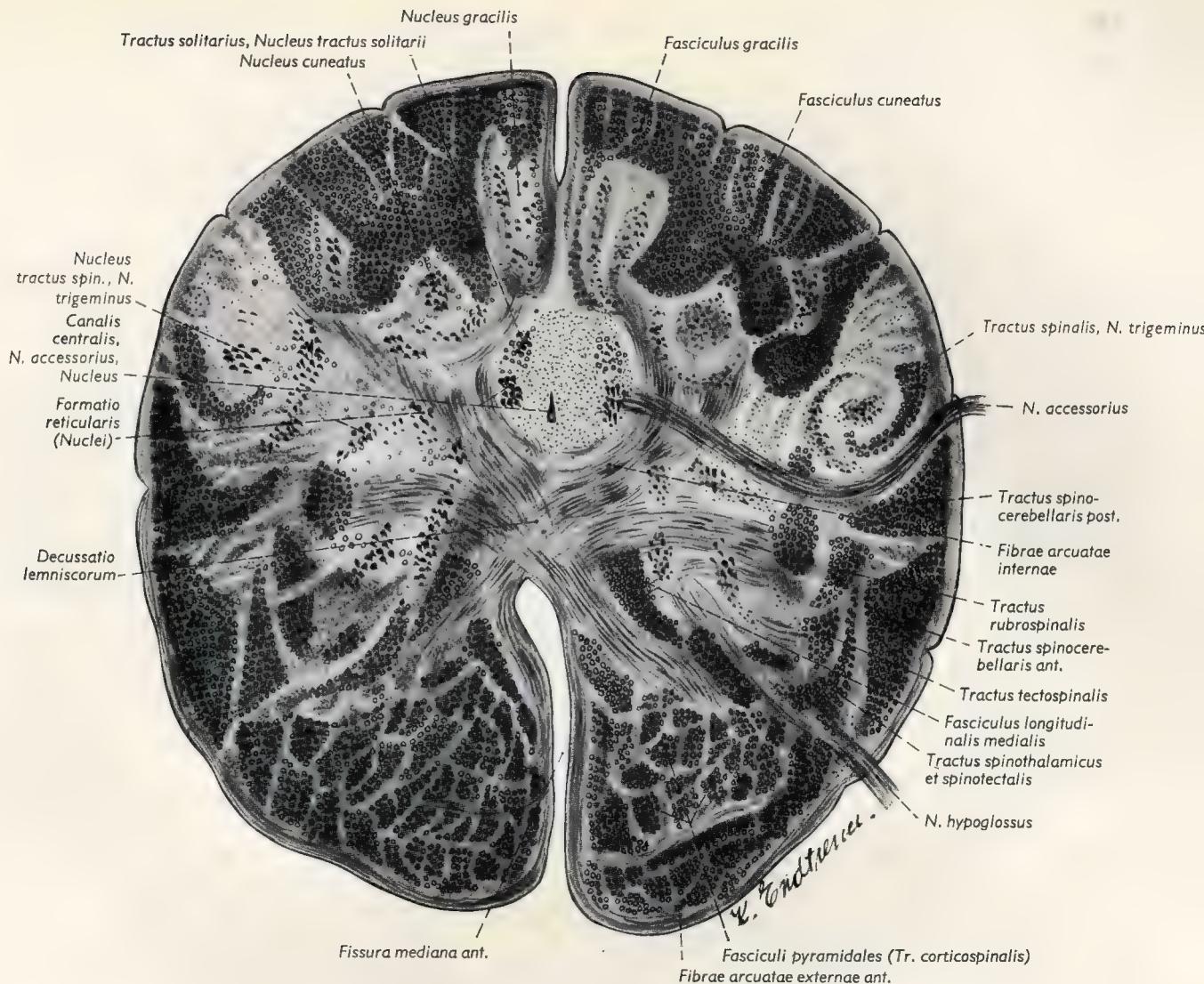


Fig. 98. (Top) Rhombencephalon and midbrain viewed from right side.

Fig. 99. (Bottom) Dissection of brain stem and cerebellum, from right side.
Demonstration of lemnisci and cerebellar tracts.

Fig. 100. (Right, top) Cross section of medulla oblongata at the level of the lemniscal decussation.

Fig. 101. (Right, bottom) Cross section through medulla oblongata in the lower third of the olive showing nuclei and tracts.



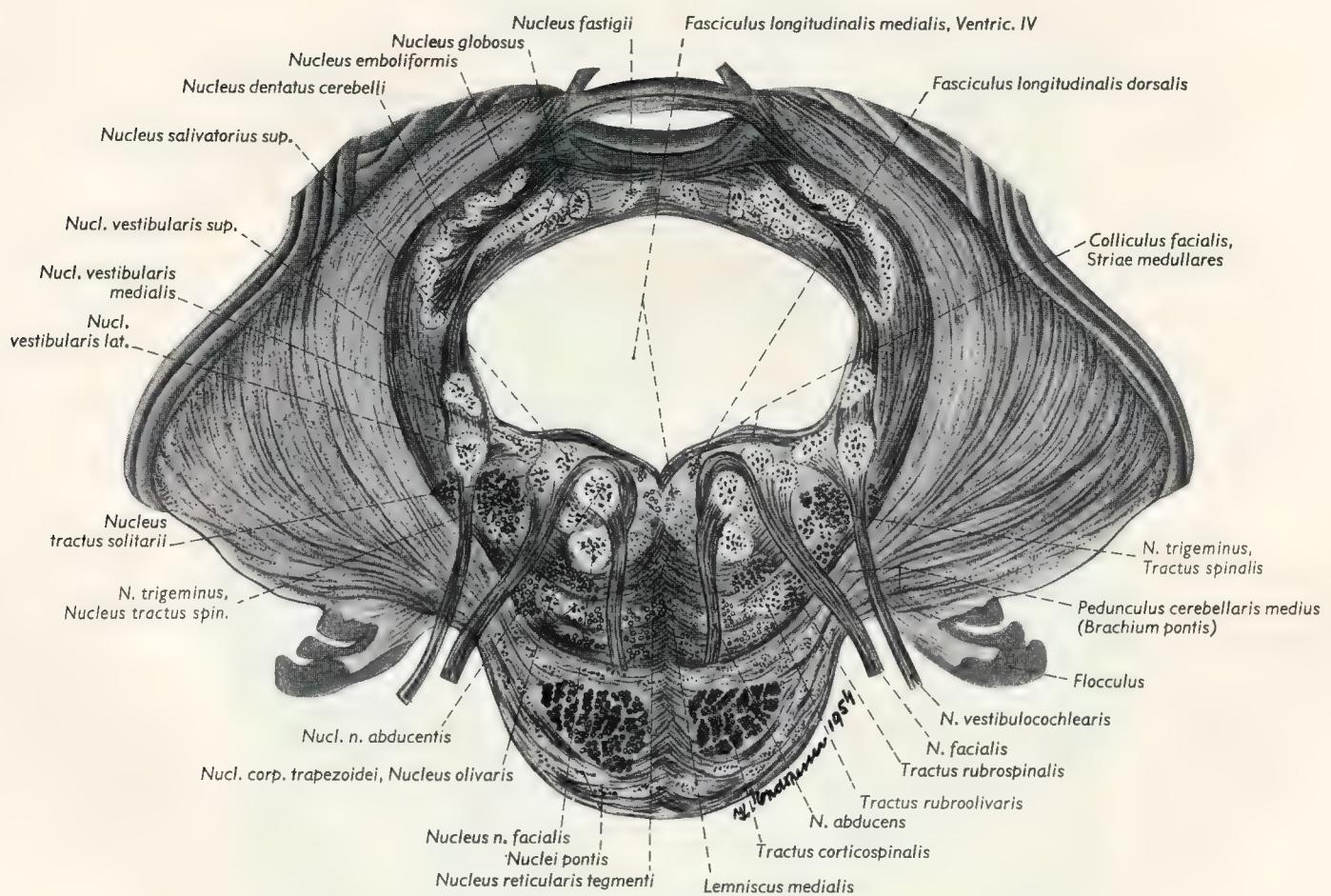
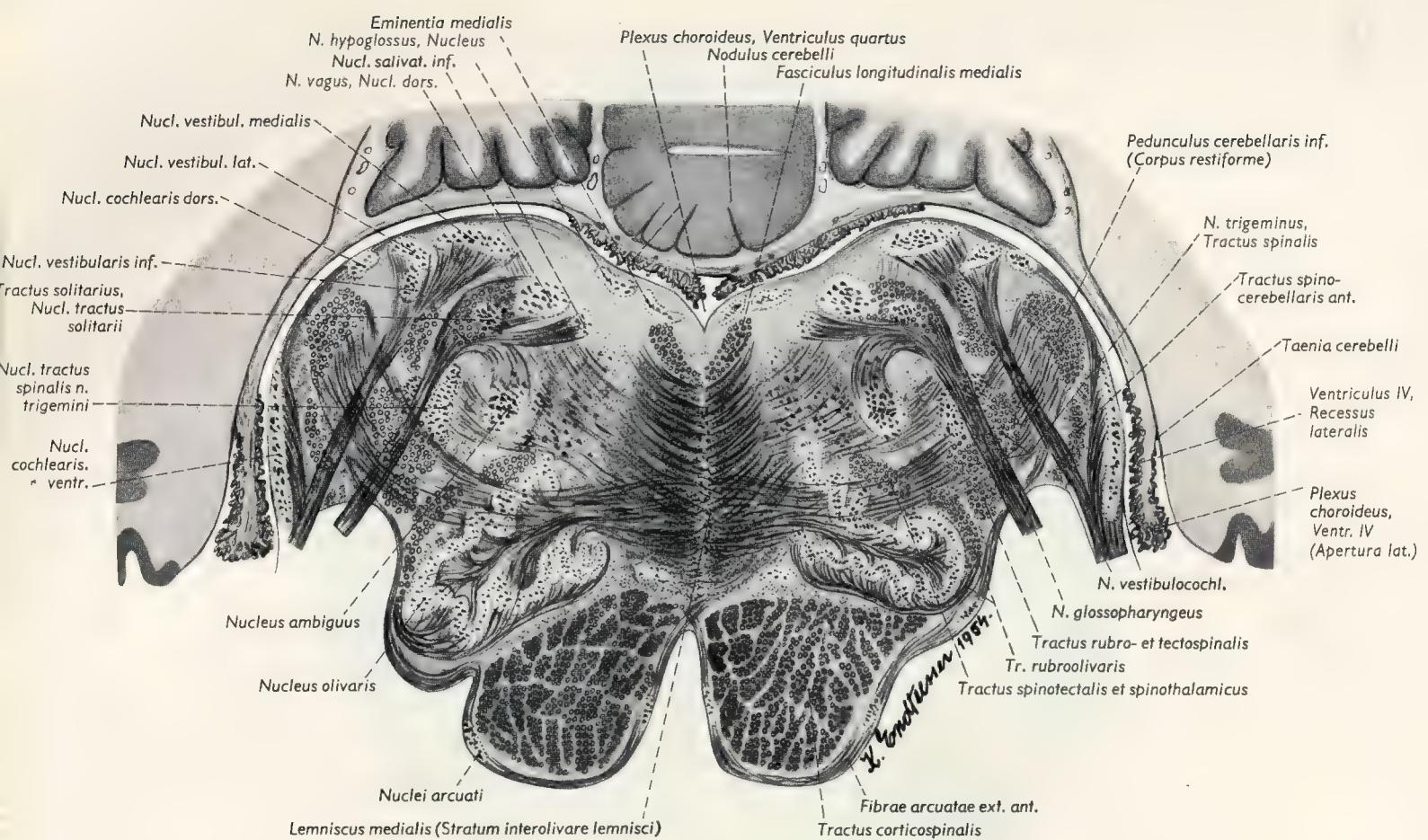
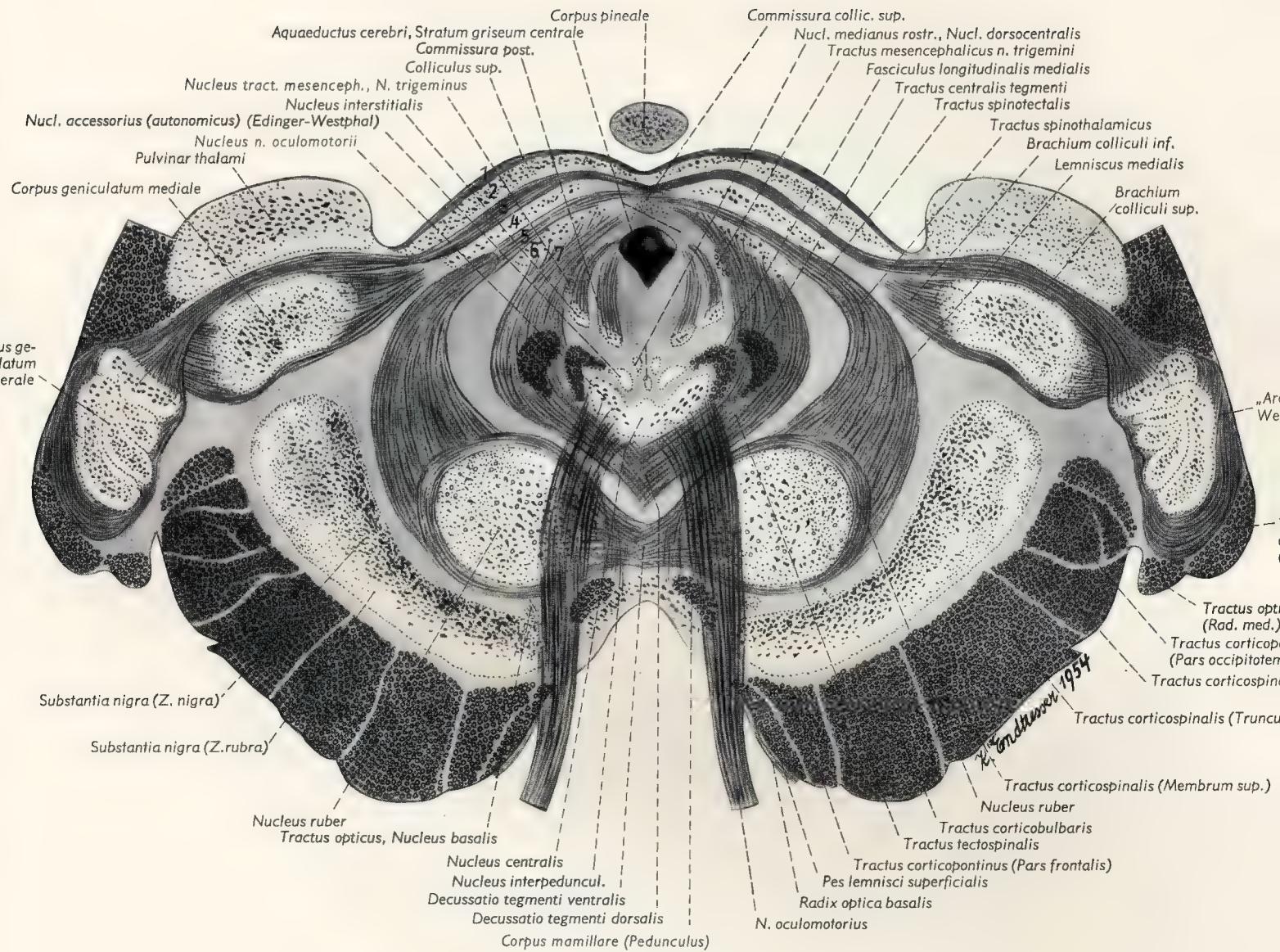


Fig. 102. (Top) Cross section through medulla oblongata at the level of the lateral recess of the fourth ventricle.

Fig. 103. (Bottom) Cross section through pons at the level of the facial and abducens nuclei.



Strata of the superior colliculus:

- 1 = Stratum zonale
- 2 = Stratum griseum superficiale
- 3 = Stratum medullare superficiale (Stratum opticum)

4 = Stratum griseum medium

5 = Stratum medullare medium (Stratum lemniscale)

6 = Stratum griseum profundum

7 = Stratum medullare profundum

Fig. 104. Cross section of the midbrain through the superior colliculi.

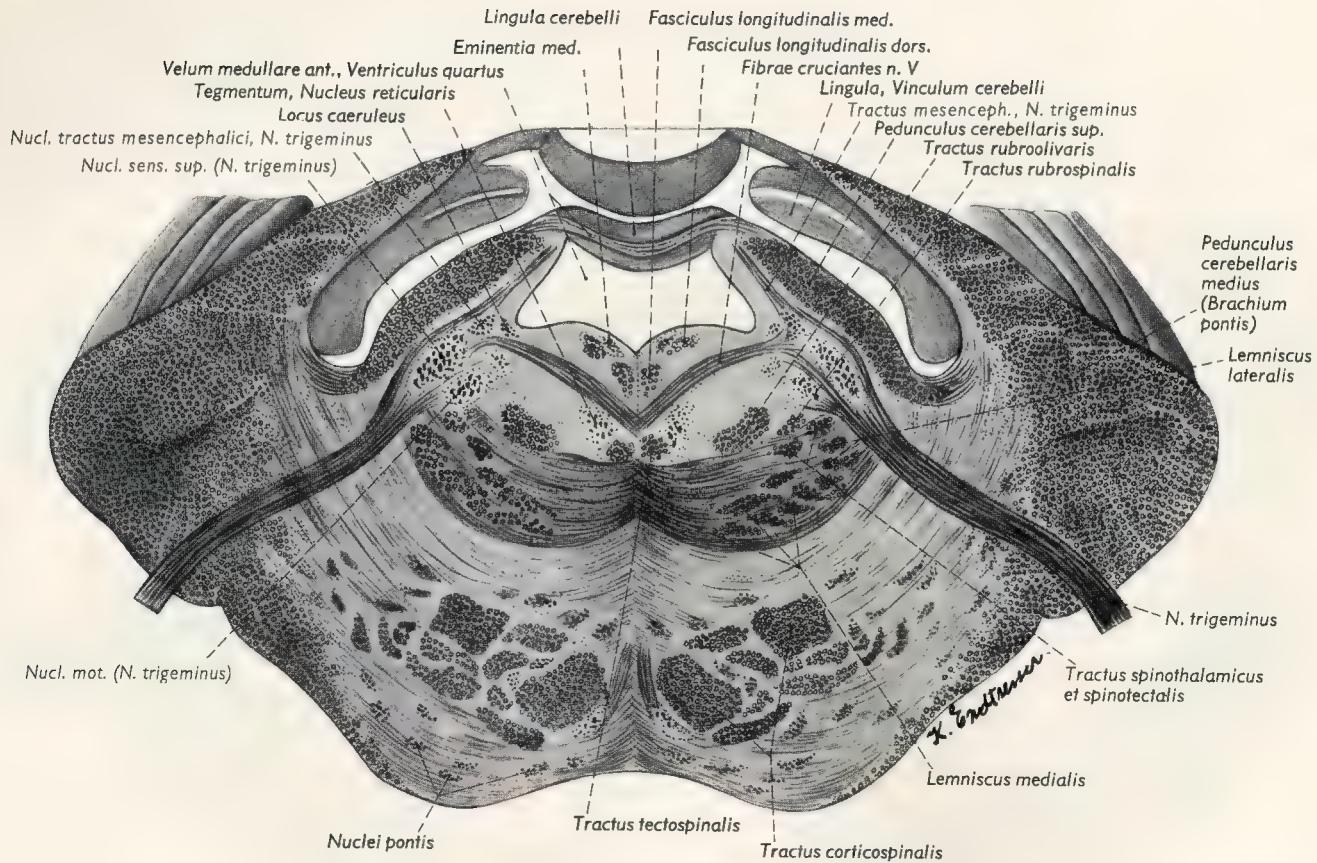


Fig. 105. Cross section of pons at the level of the trigeminal nerve.

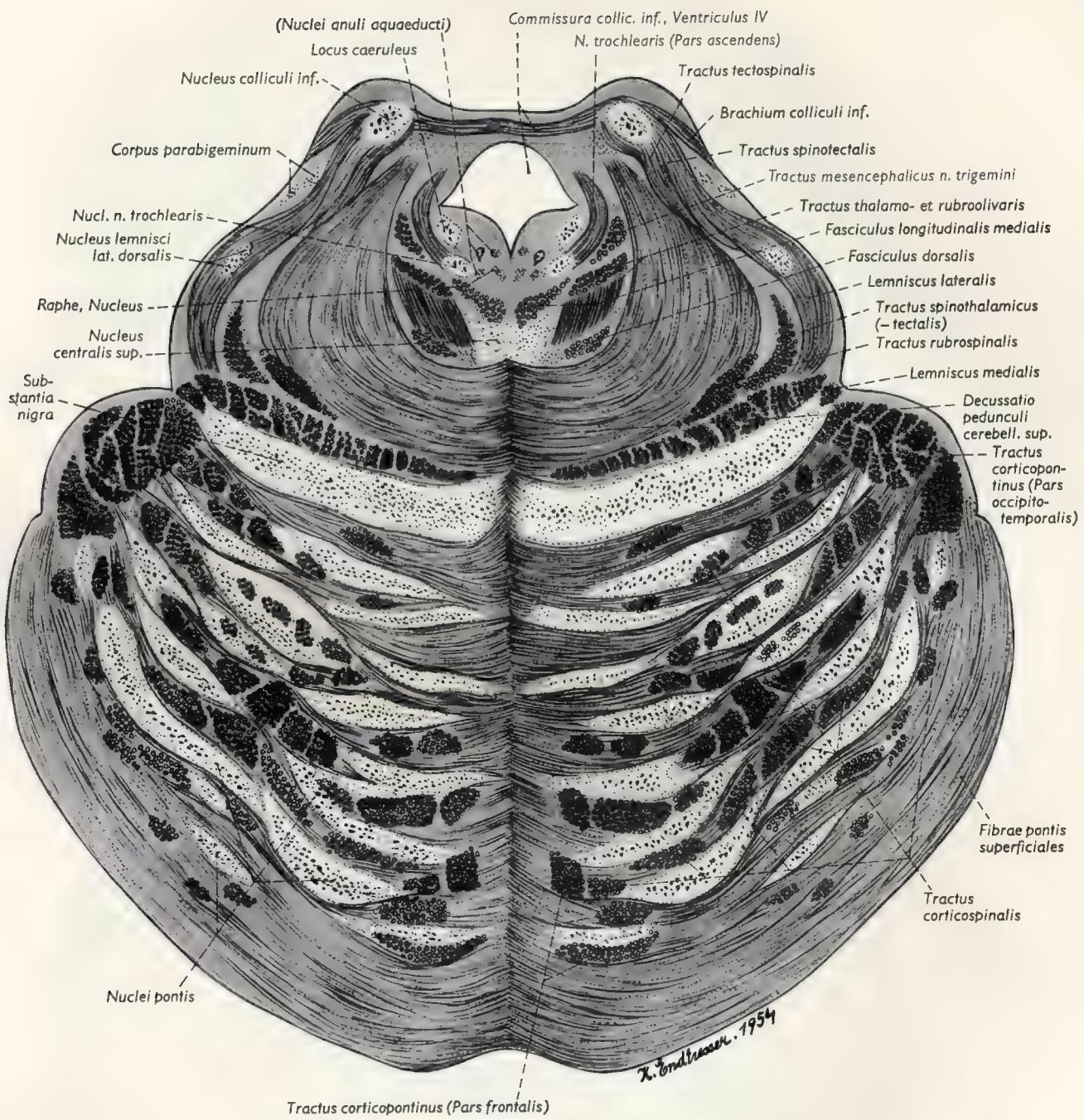


Fig. 106. Cross section of the brain stem at the level of the inferior colliculi.

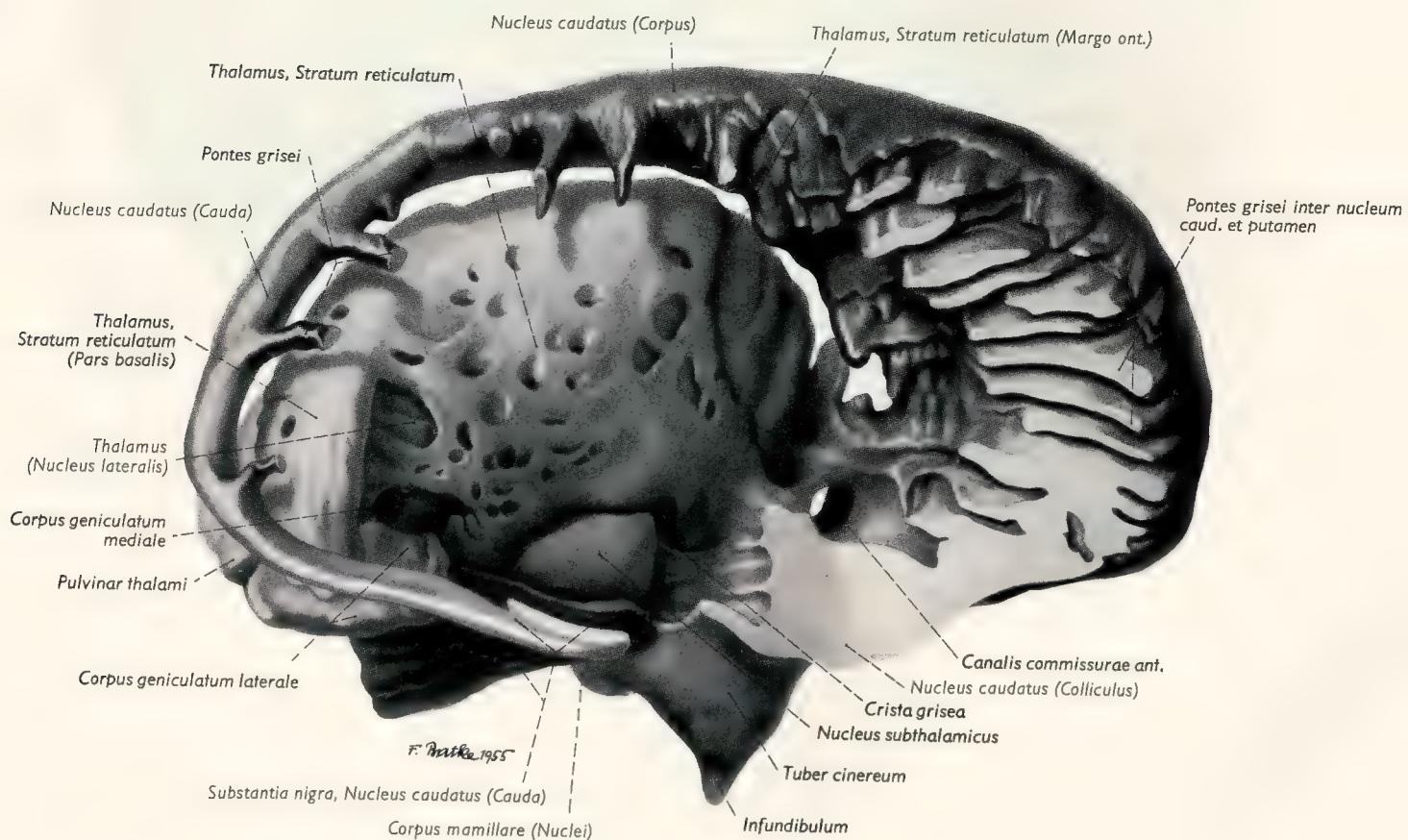
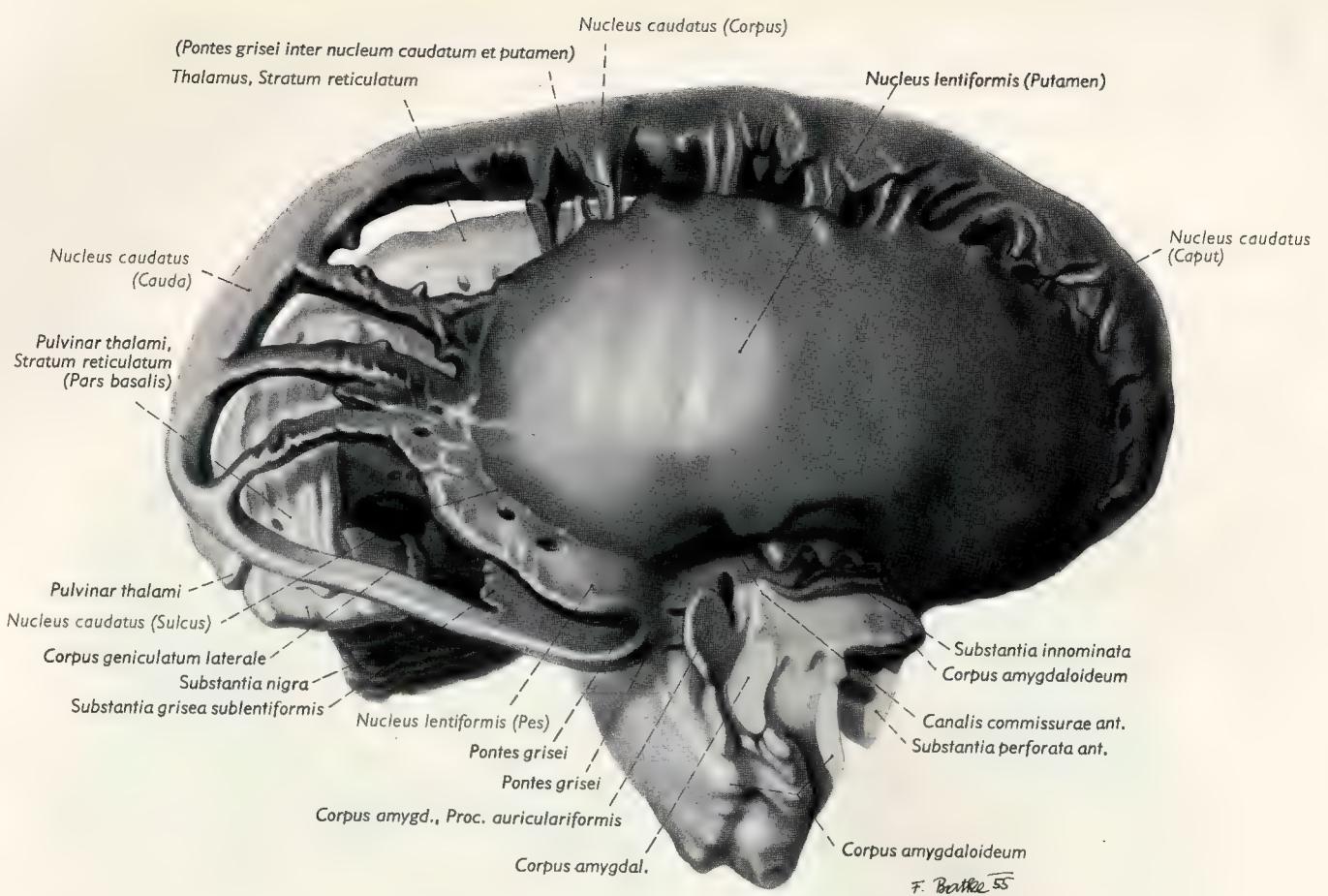


Fig. 107. (Top) Caudate and lentiform nuclei. Lateral view of basal ganglia of right half of brain after removal of claustrum. Drawn from a model.

Fig. 108. (Bottom) Lateral view of the basal ganglia drawn from a model. The lentiform nucleus, amygdaloid body and anterior perforated substance have removed. Lateral view of thalamus and caudate nucleus.

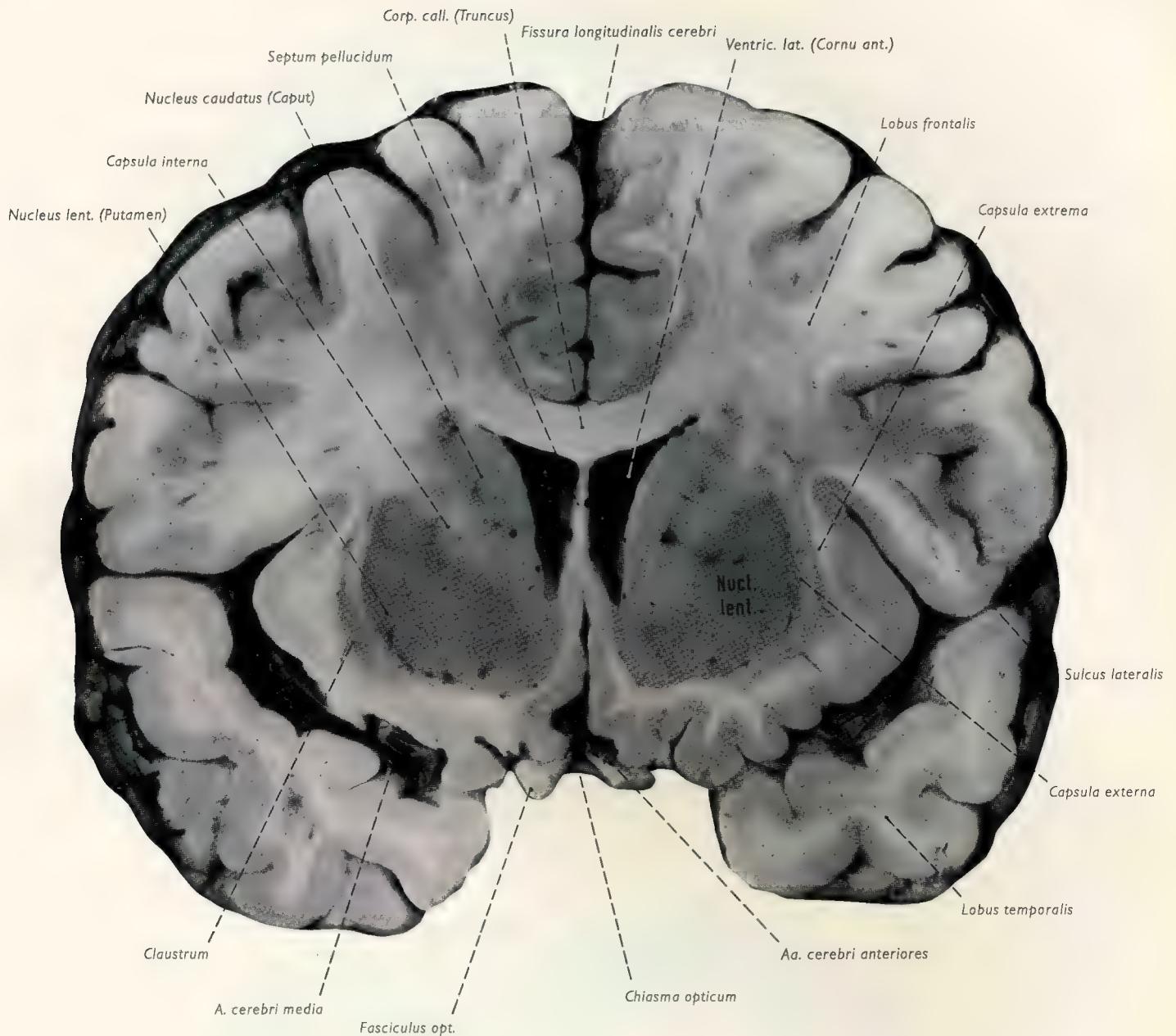
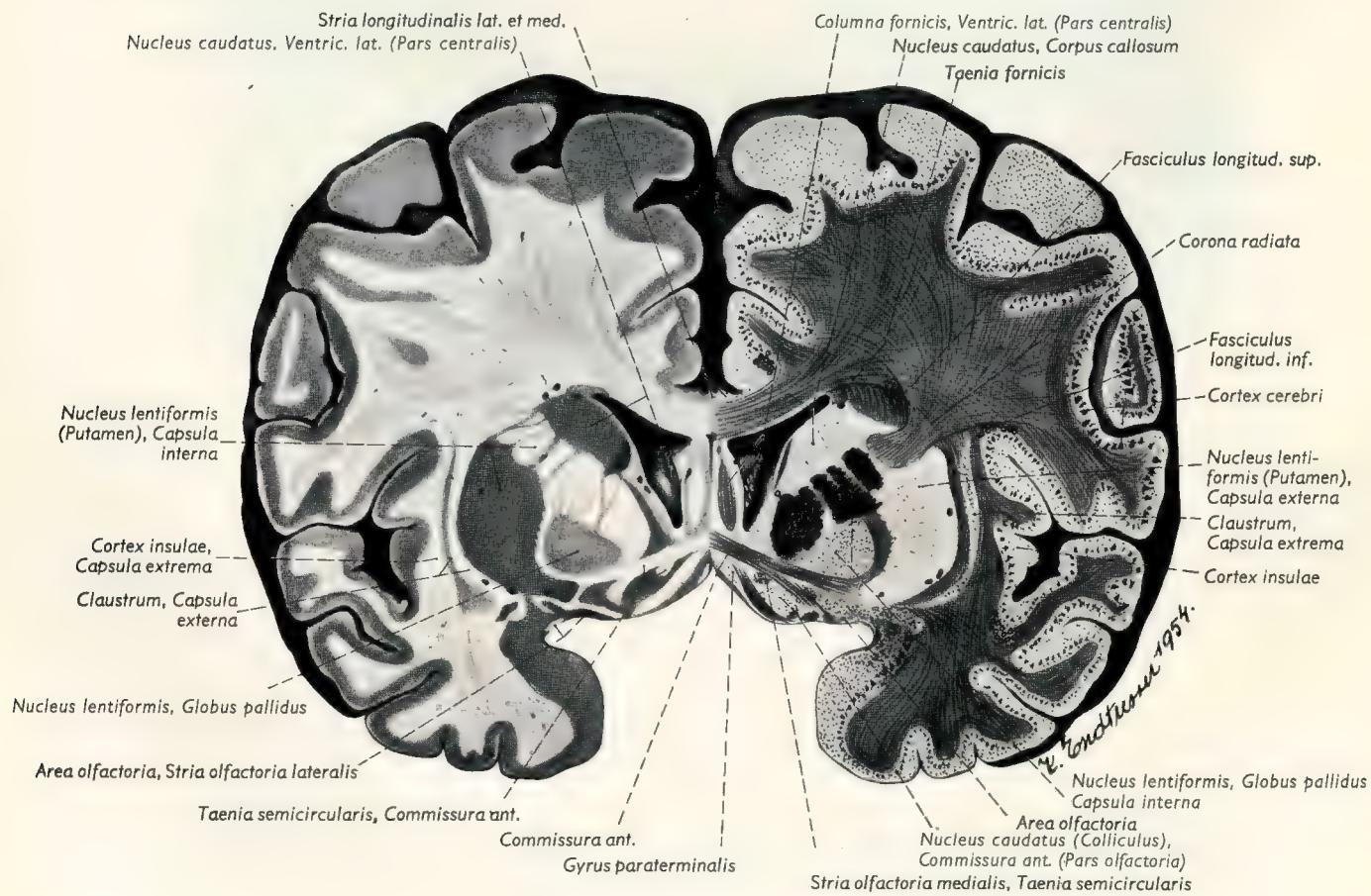
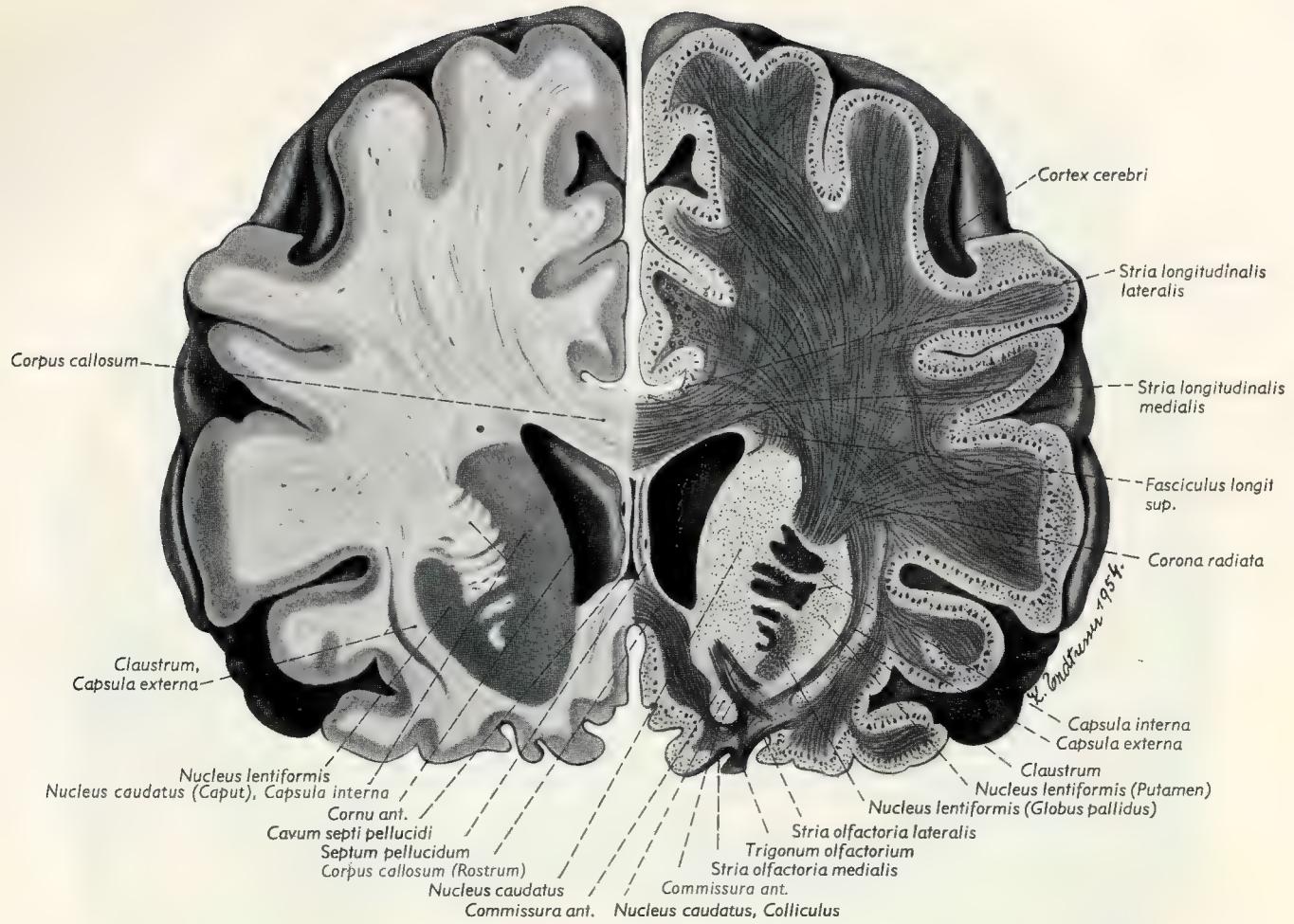


Fig. 109. Frontal section through the brain (prosencephalon) anterior to the thalamus, the optic chiasm and the interventricular foramen. The choroid plexus is not present in the anterior horn.



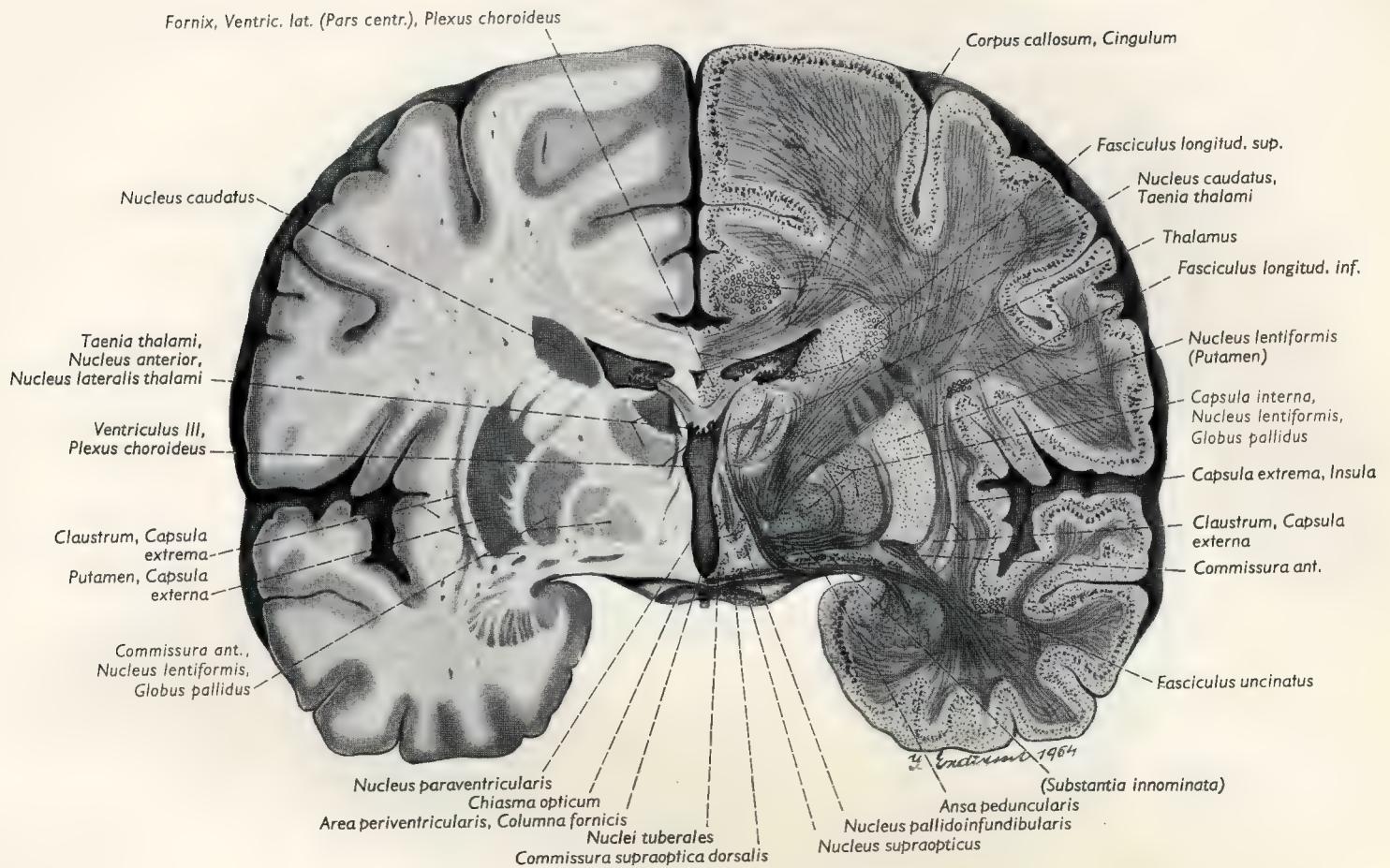


Fig. 112. Frontal section of the brain through the third ventricle and the central part of the lateral ventricle, seen from the front. Cell structure and fiber tracts are drawn on one half of the section.

Fig. 110. (Left, top) Frontal section of the brain through the anterior horn of the lateral ventricle. Cell structure and fiber tracts are drawn on one half of the section.

Fig. 111. (Left, bottom) Frontal section of the brain through the boundary between the anterior horn and the central part of the lateral ventricle, seen from the front. The cut was conducted so that the columns of the fornix were sectioned squarely. Cell structure and fiber tracts are drawn on one half of the section.

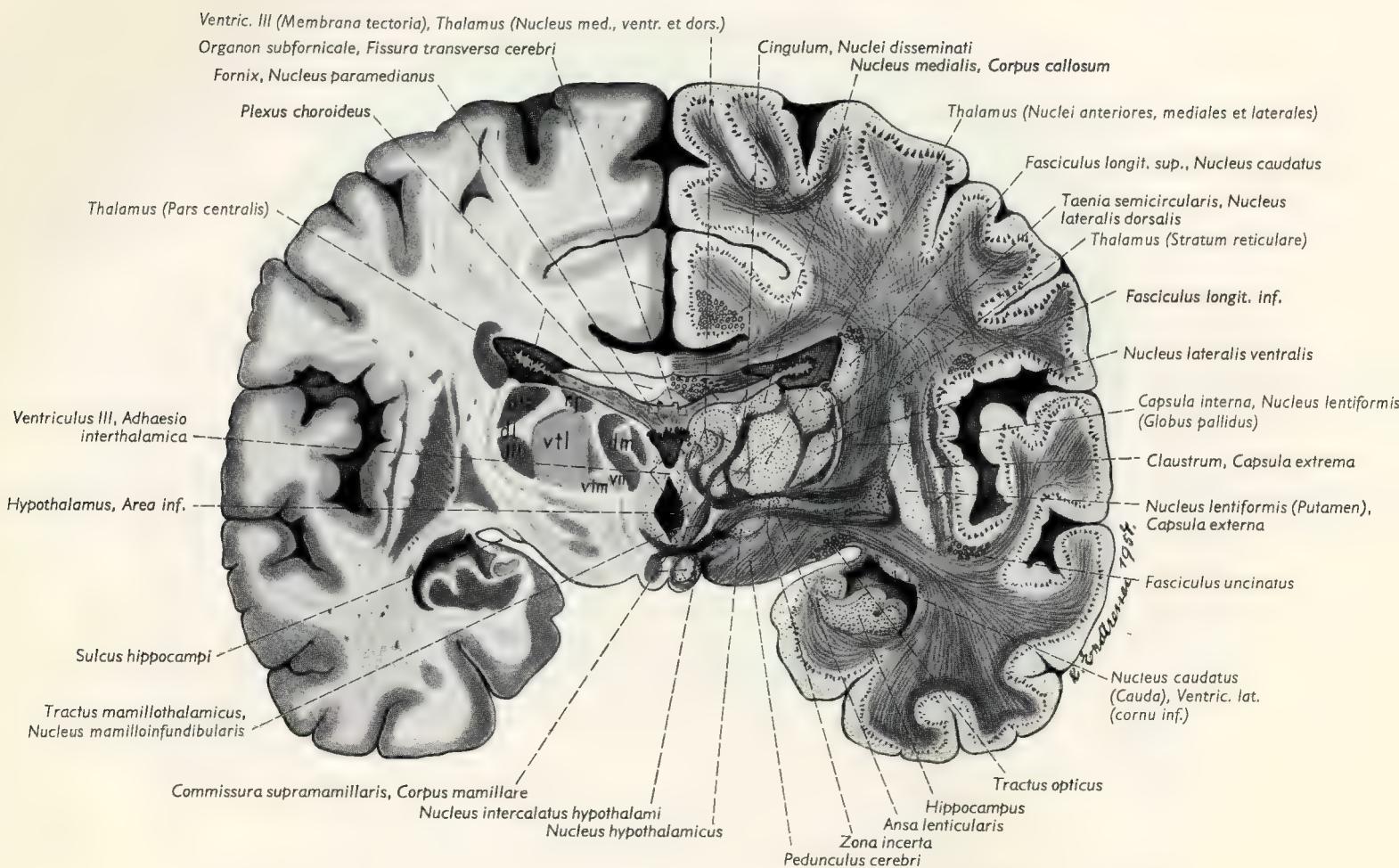


Fig. 113. Frontal section of the brain viewed from the front. The cut was conducted through the rostral part of the thalamus, the mamillary bodies and the interthalamic adhesion of the third ventricle. Cell structure and fiber tracts are drawn on one half of the section.

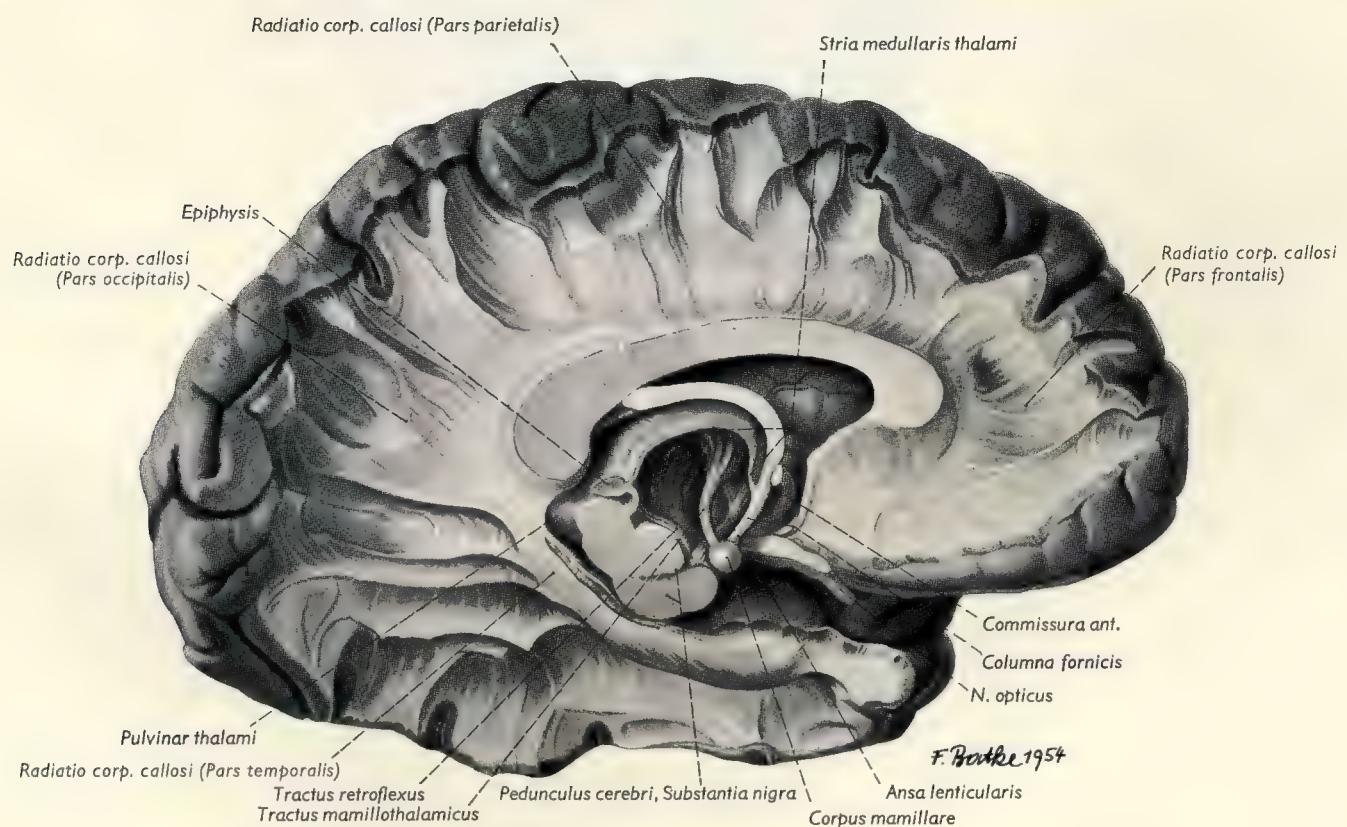
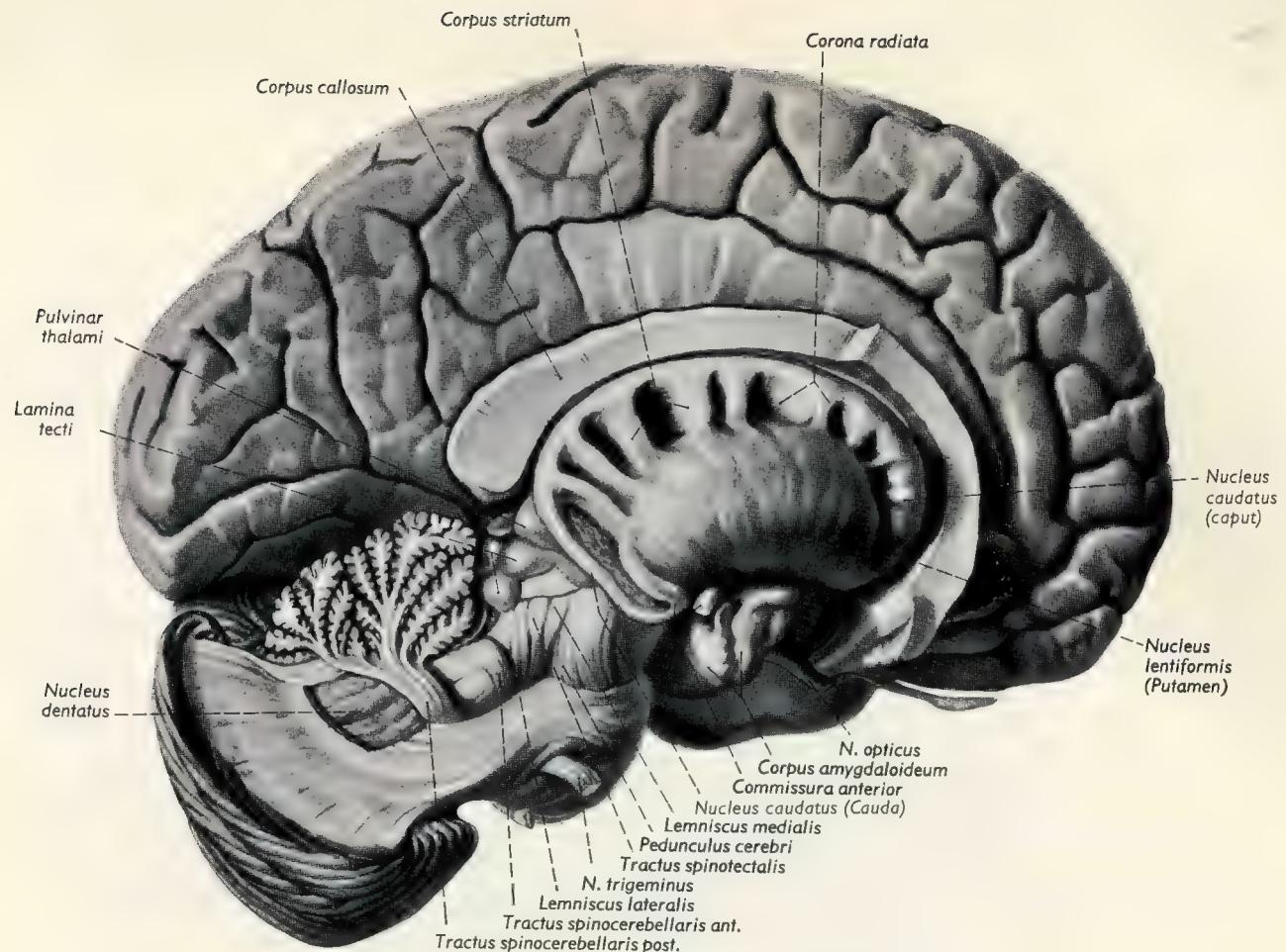


Fig. 114 (Top) Dissection of cerebellar tracts, the medial and lateral lemnisci as well as the caudate nucleus, lentiform nucleus and amygdaloid body.

Fig. 115. (Bottom) Radiations of corpus callosum to the left hemisphere, medial view. The anterior commissure, columns of the fornix, mamillothalamic tract, retroflexus and ansa lenticularis are also brought into view. In order to expose these structures, portions of the thalamus were removed.

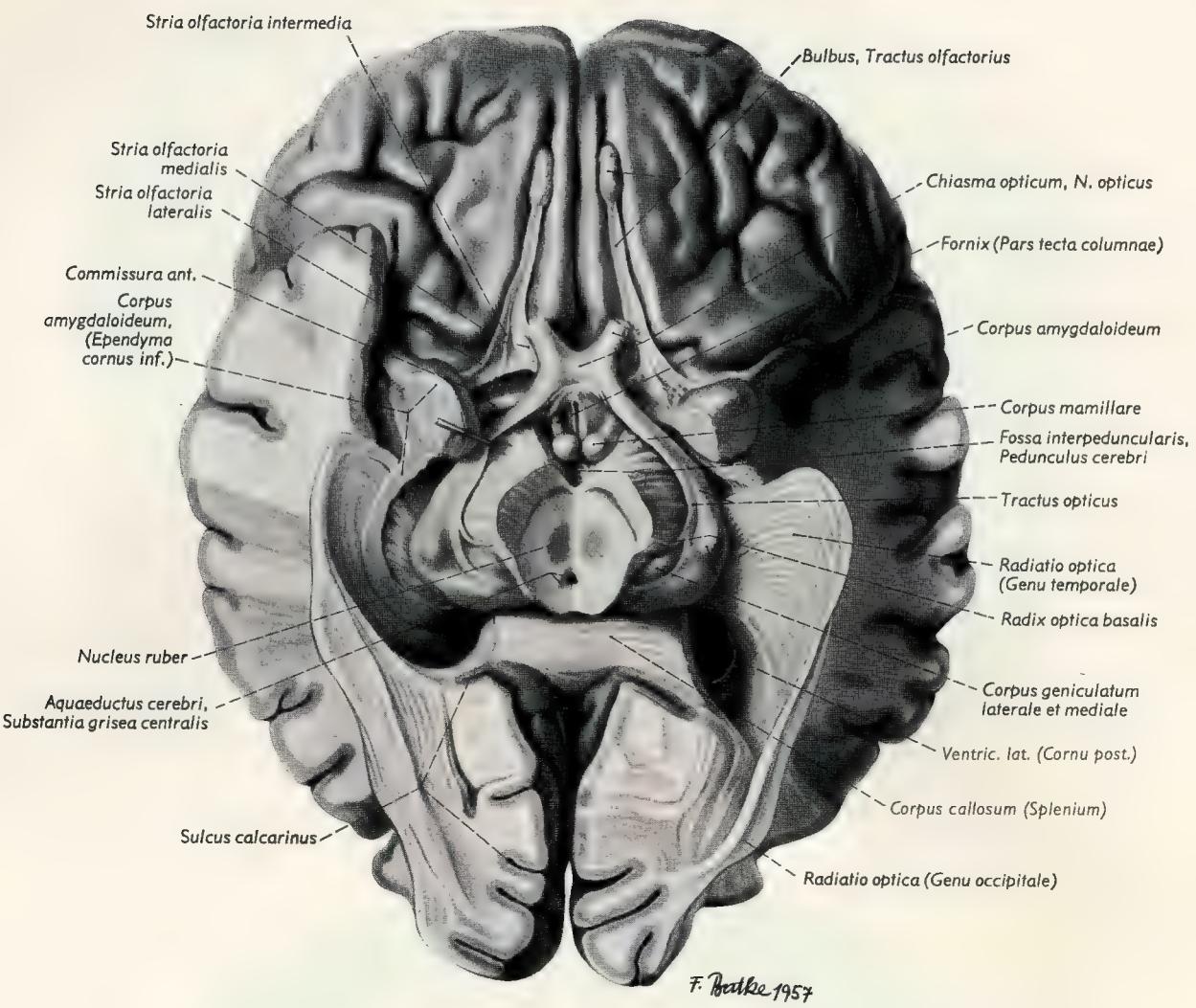


Fig. 116. Dissection of the optic pathway, the optic radiation in particular.

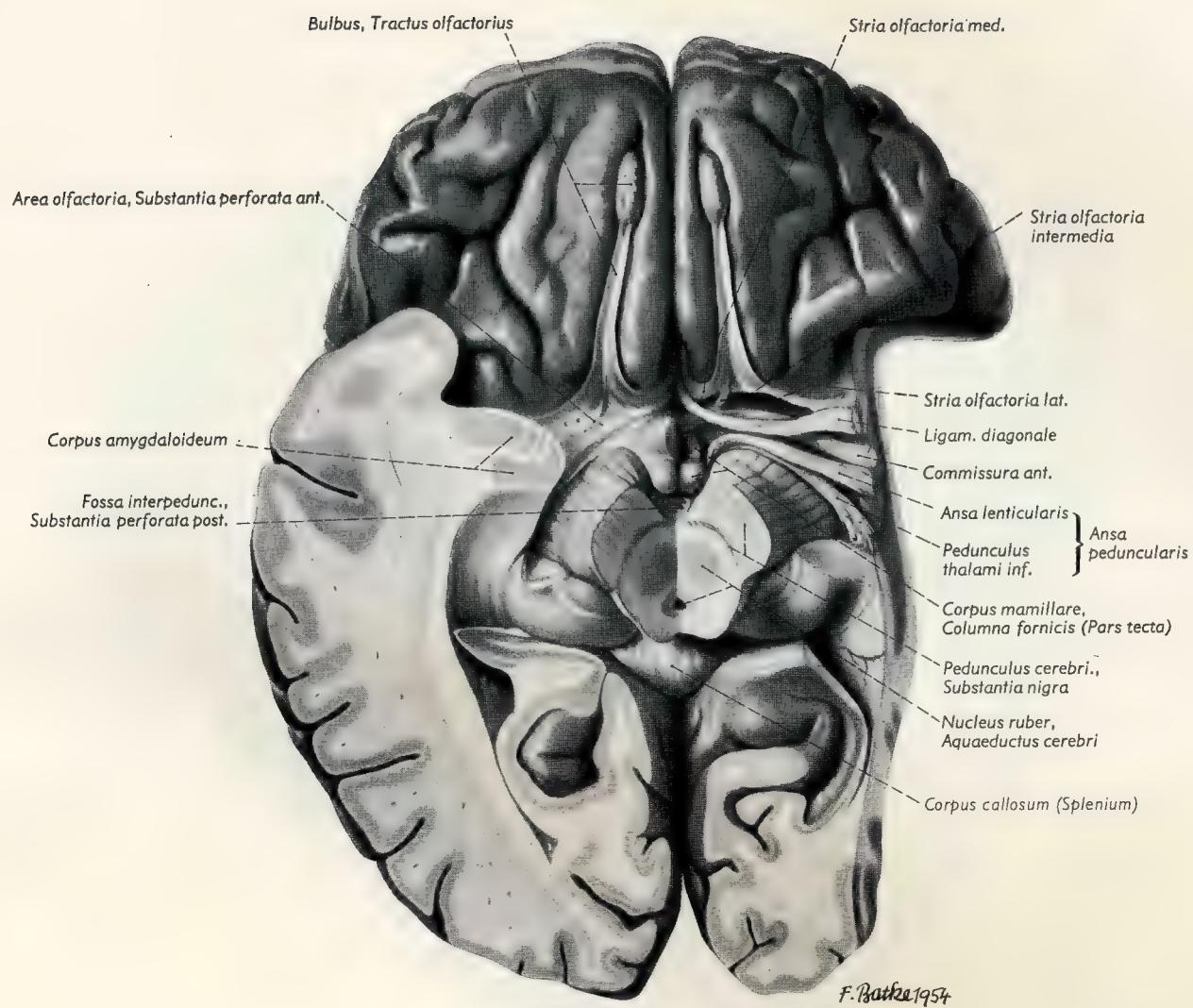


Fig. 117. Dissection of ansa peduncularis and the anterior commissure, seen from below.

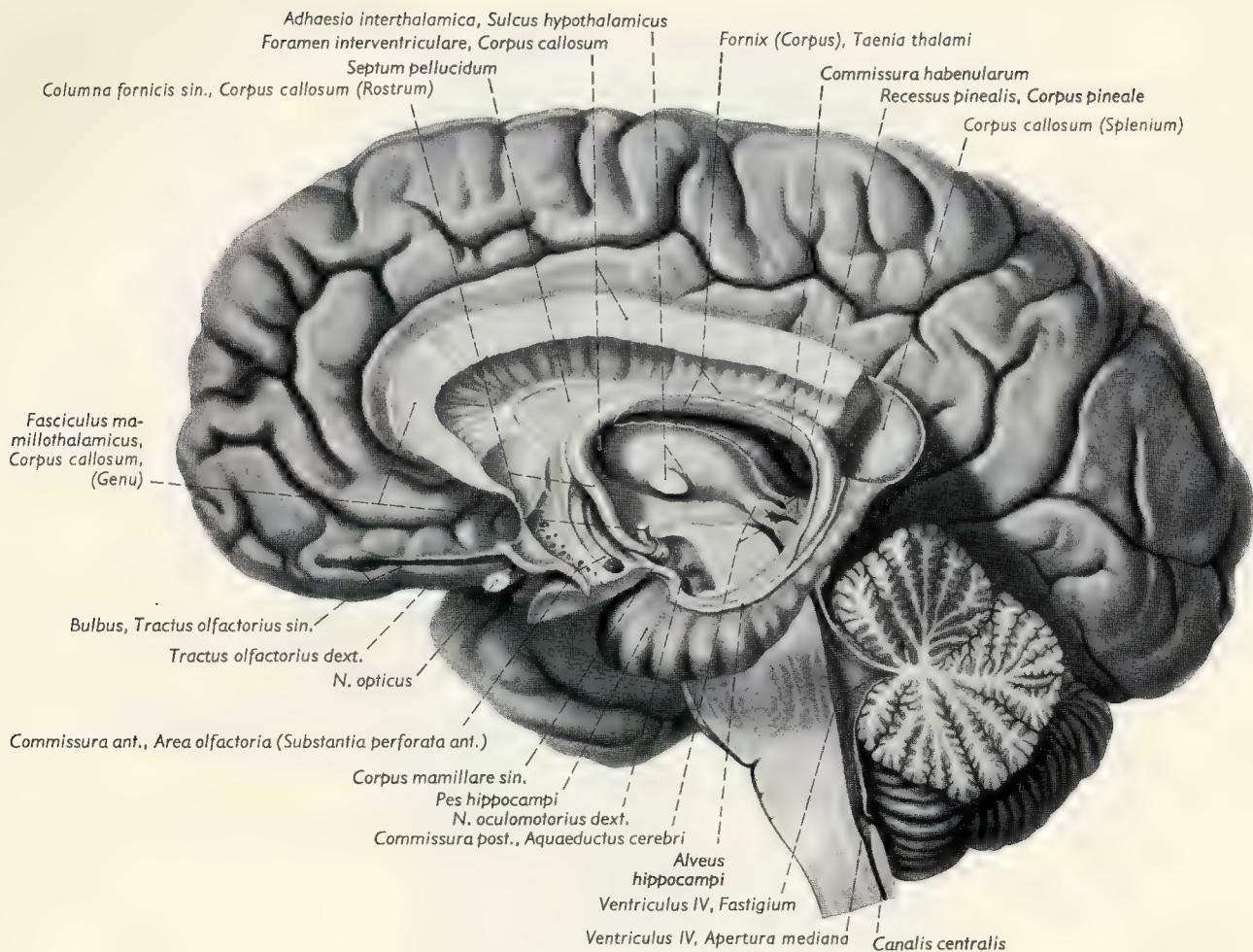


Fig. 118. Lateral view of the left fornix. The hippocampus, the anterior commissure, the olfactory bulb and tract on the left side are also shown. The section through the brain stem was made in the midline; corpus callosum was cut in a left parasagittal plane.

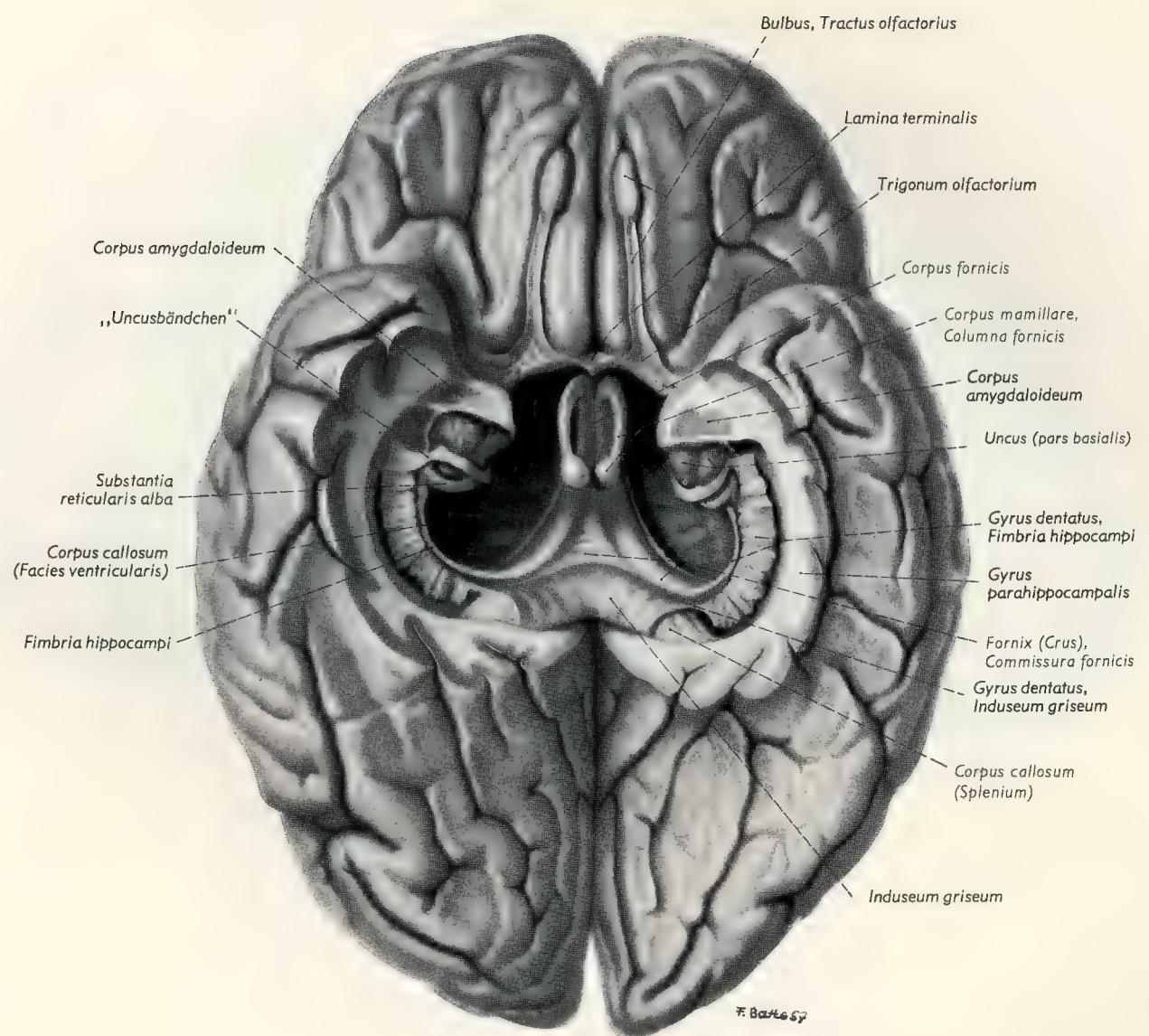
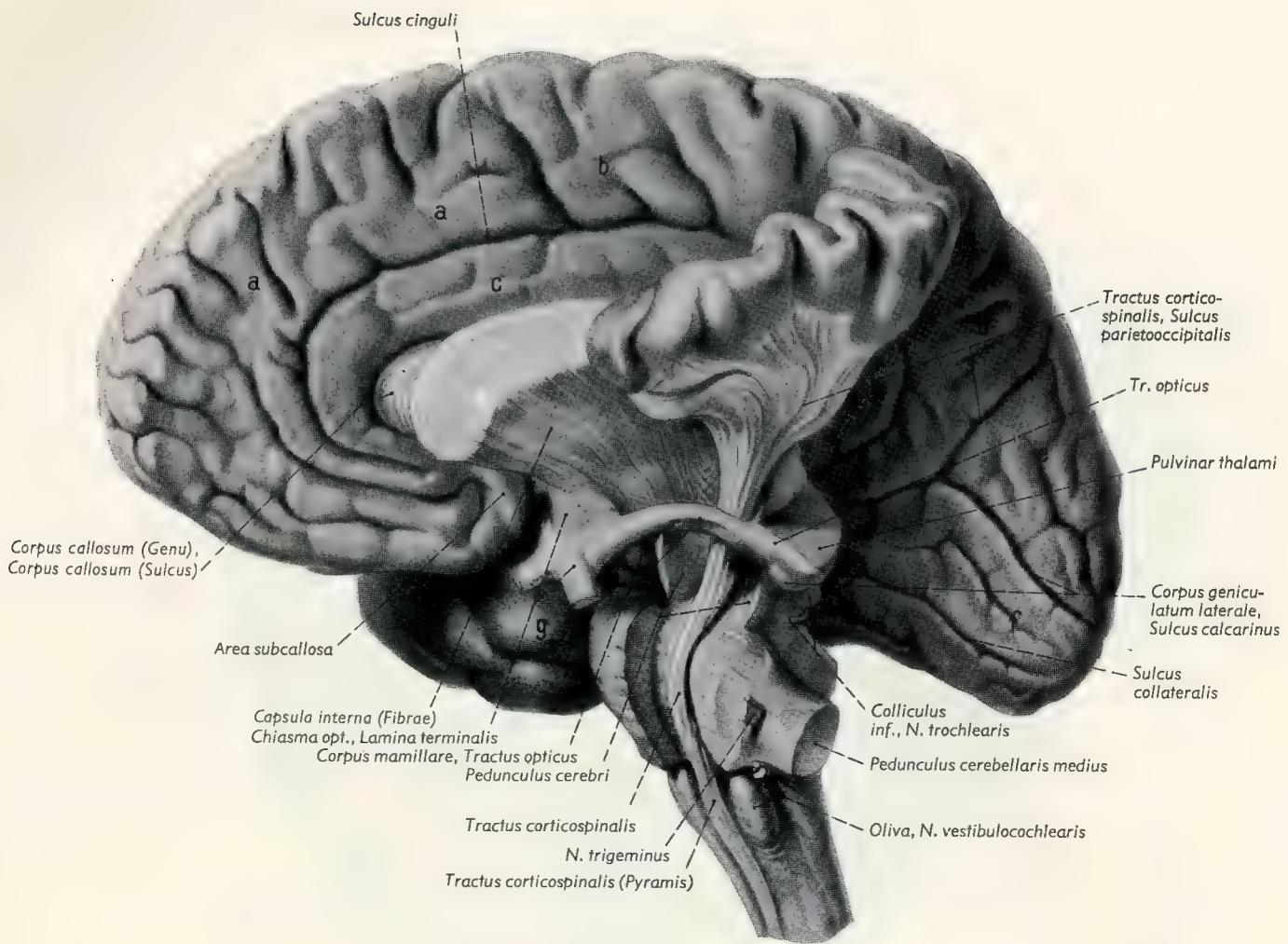


Fig. 119. Inferior view of right and left fornix and dentate gyrus. The parahippocampal gyrus and the basal ganglia have been removed (from a preparation by J. Klingler, Basel).



<i>a = Gyrus frontalis superior</i>	<i>e = Cuneus</i>
<i>b = Lobulus paracentralis</i>	<i>f = Gyrus occipitotemporalis</i>
<i>c = Gyrus cinguli</i>	<i>medialis</i>
<i>d = Praecuneus</i>	<i>g = Uncus gyri parahippocampalis</i>

Fig. 120. Dissection of the corticospinal tract. Portions of pons, the cerebral peduncles and the lentiform nucleus were conservatively resected in order to visualize the fibers in the area of the internal capsule. Since the precentral gyrus represents the main area of origin of the pyramidal tract, all other tracts entering or leaving the internal capsule were removed.

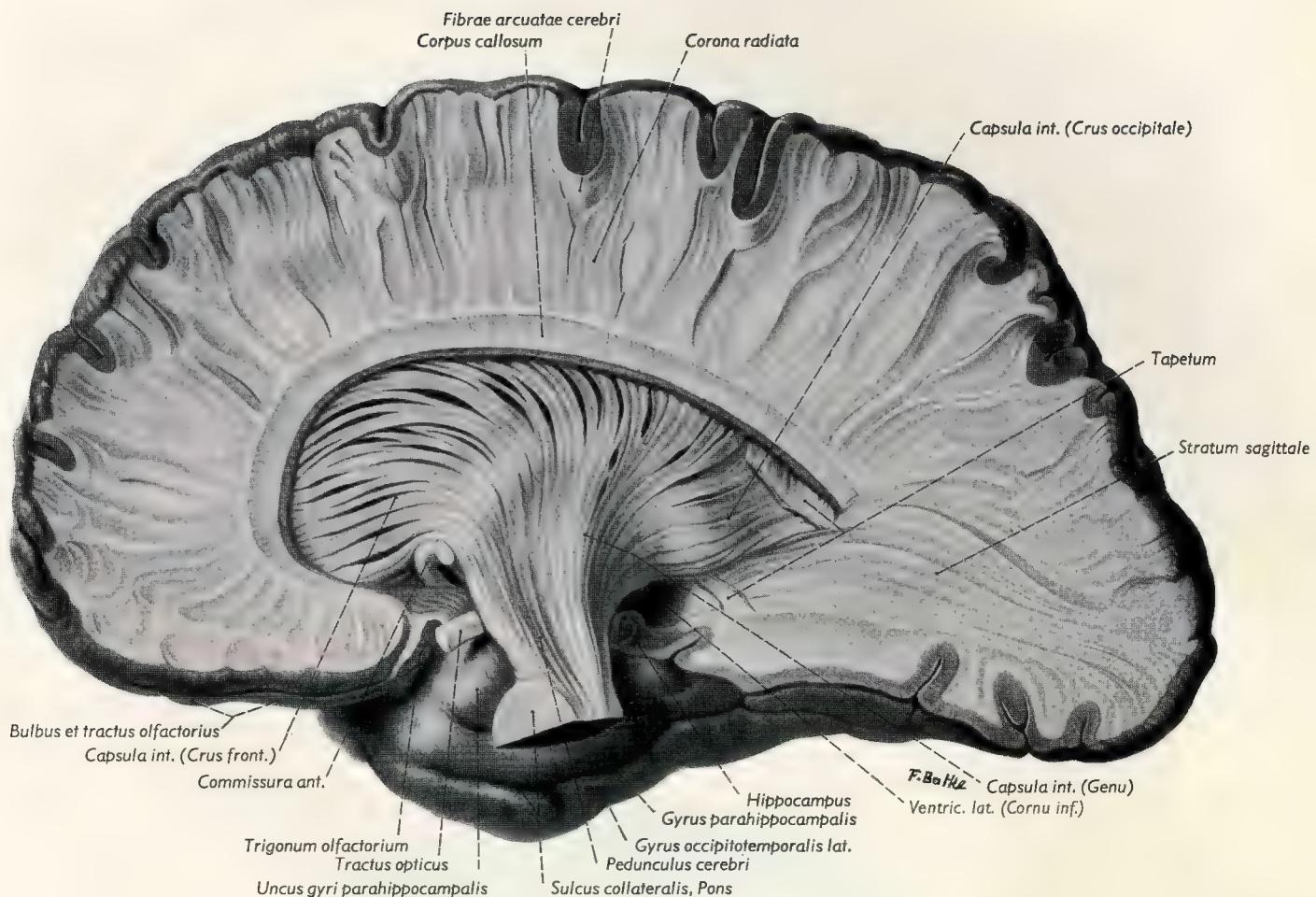


Fig. 121. Fiber preparation of corona radiata, medial view. The internal capsule was exposed by removal of the caudate nucleus and thalamus (from a preparation by J. Klingler, Basel).

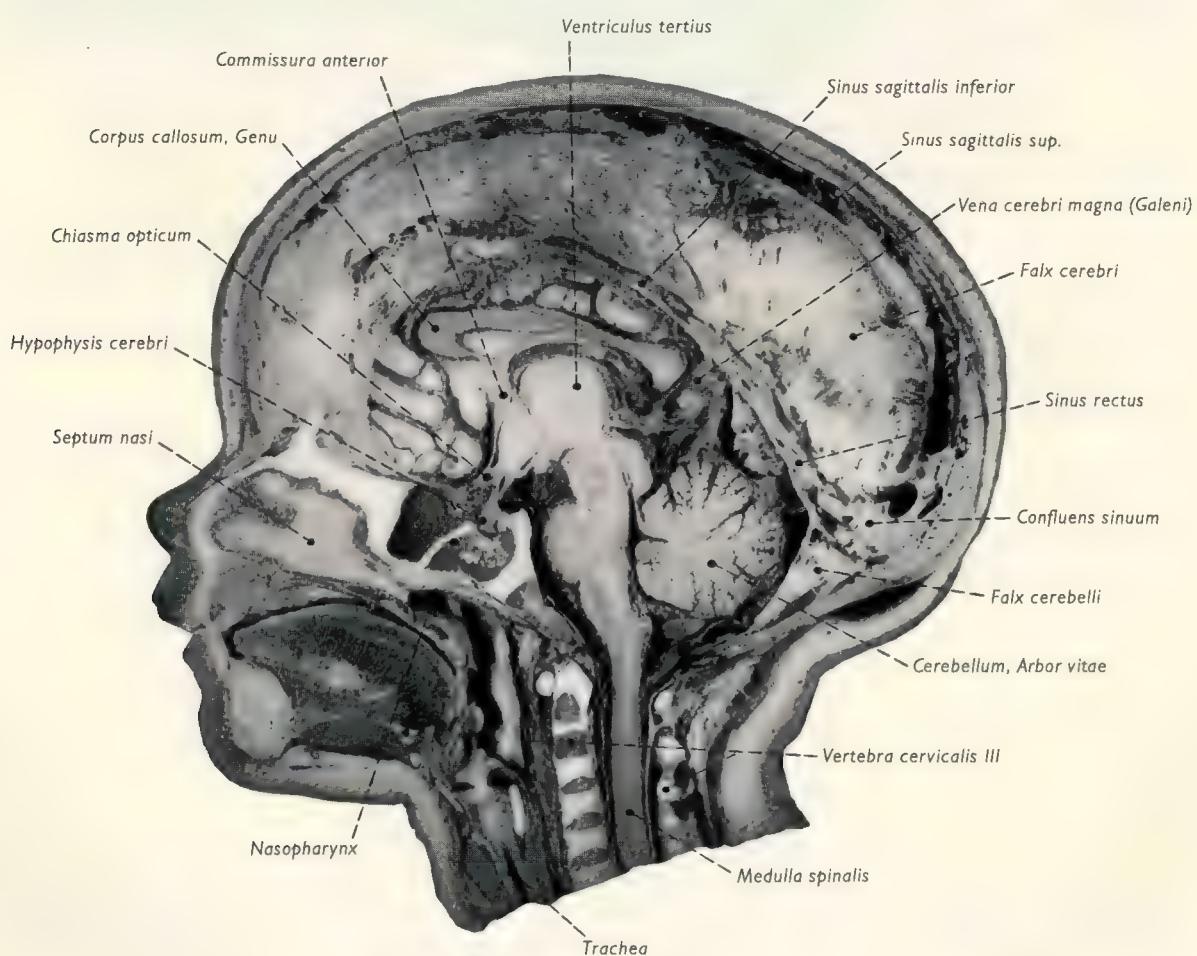
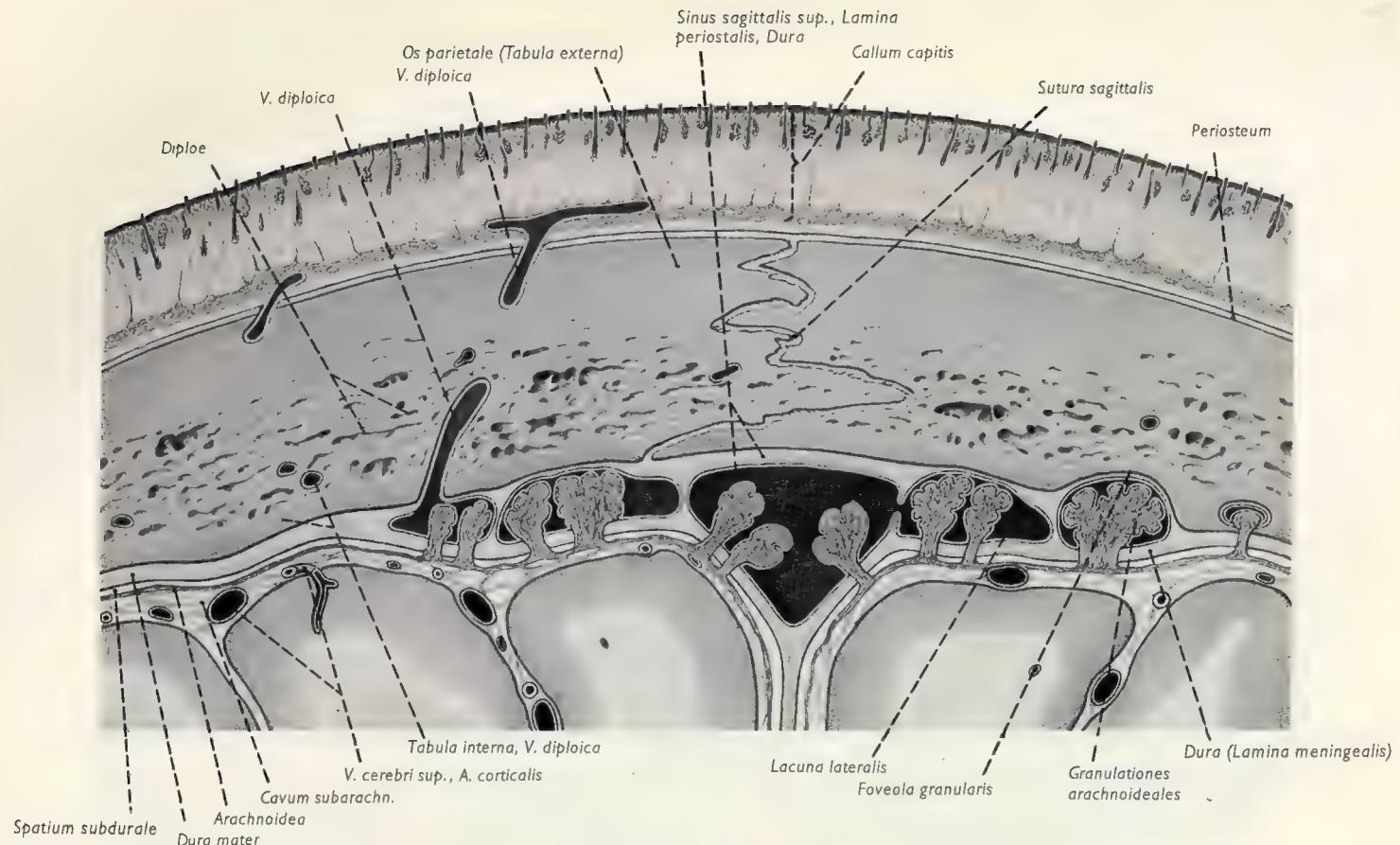


Fig. 122. (Top) Frontal section through the superior sagittal sinus and the lateral lacunae.
Note the arachnoid granulations.

Fig. 123. (Bottom) Head of a child (three week old) . Median section.

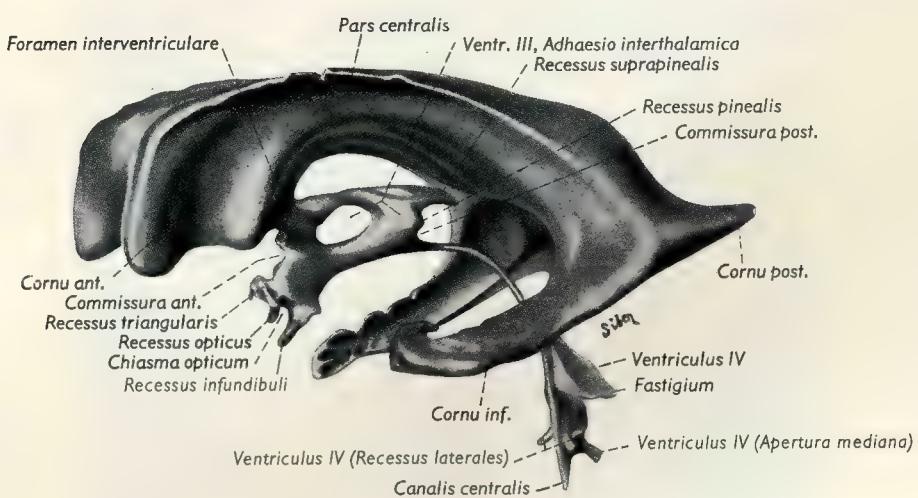
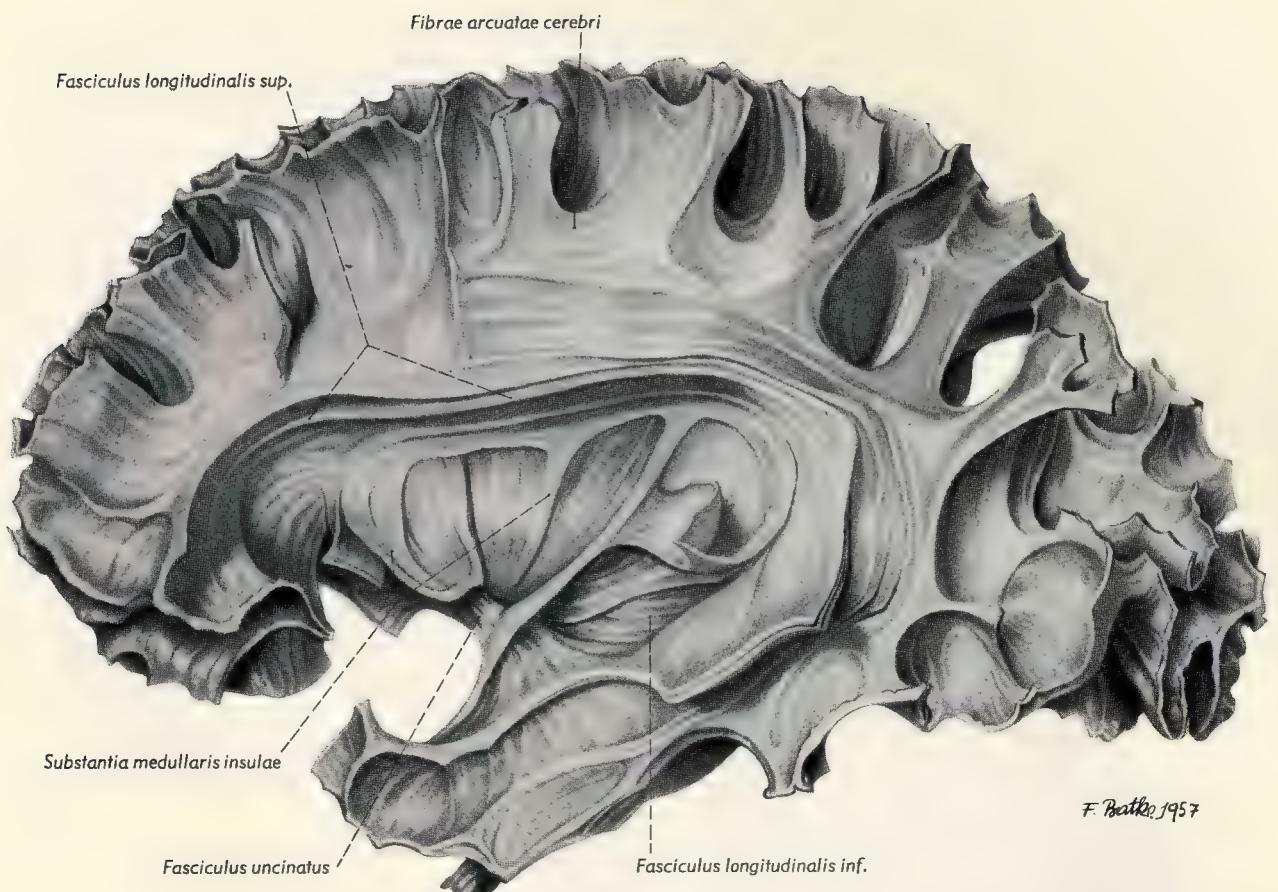


Fig. 124. (Top) Lateral view of the association pathways of the left hemisphere (from a dissection).

Fig. 125. (Bottom) Cast of the ventricular system seen from the left side. Of the lateral ventricles only the left one is labeled.

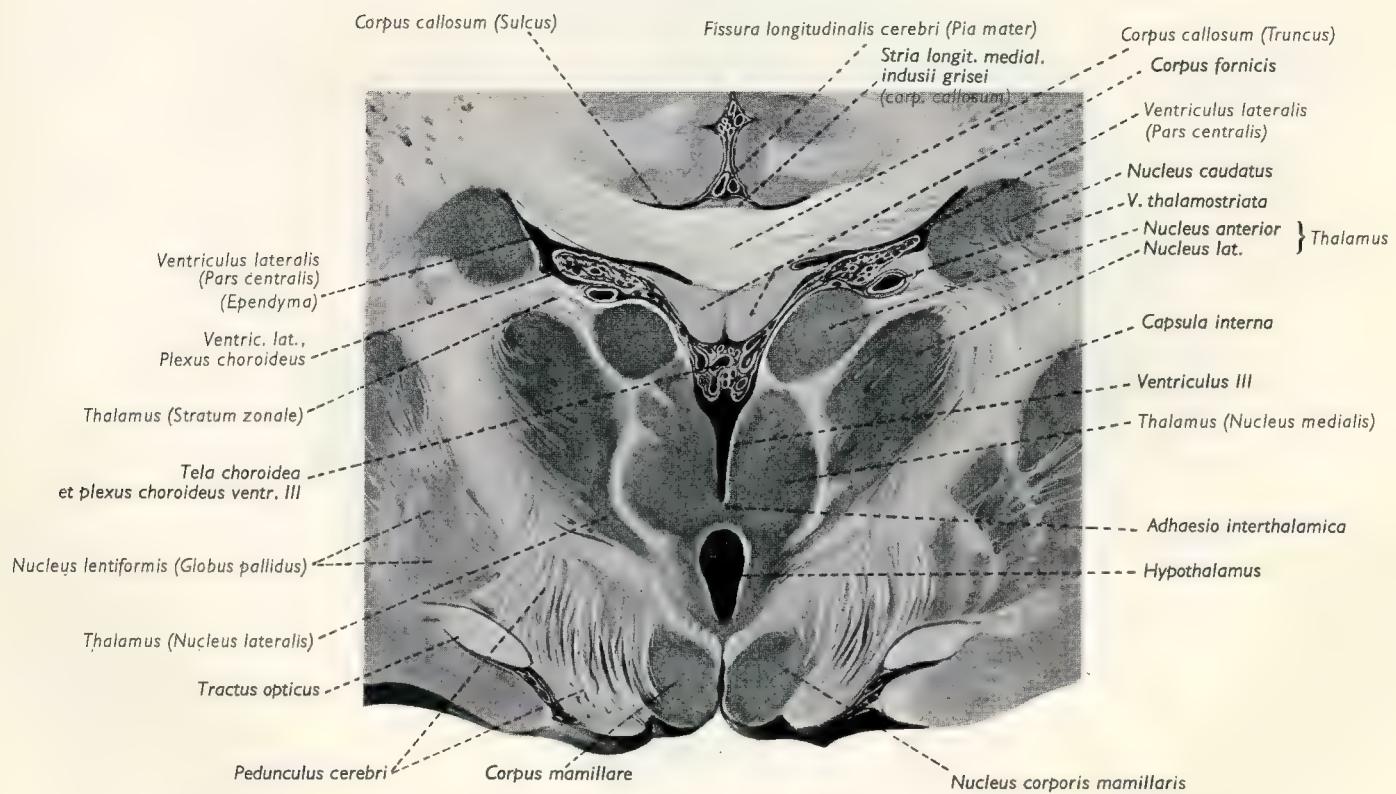
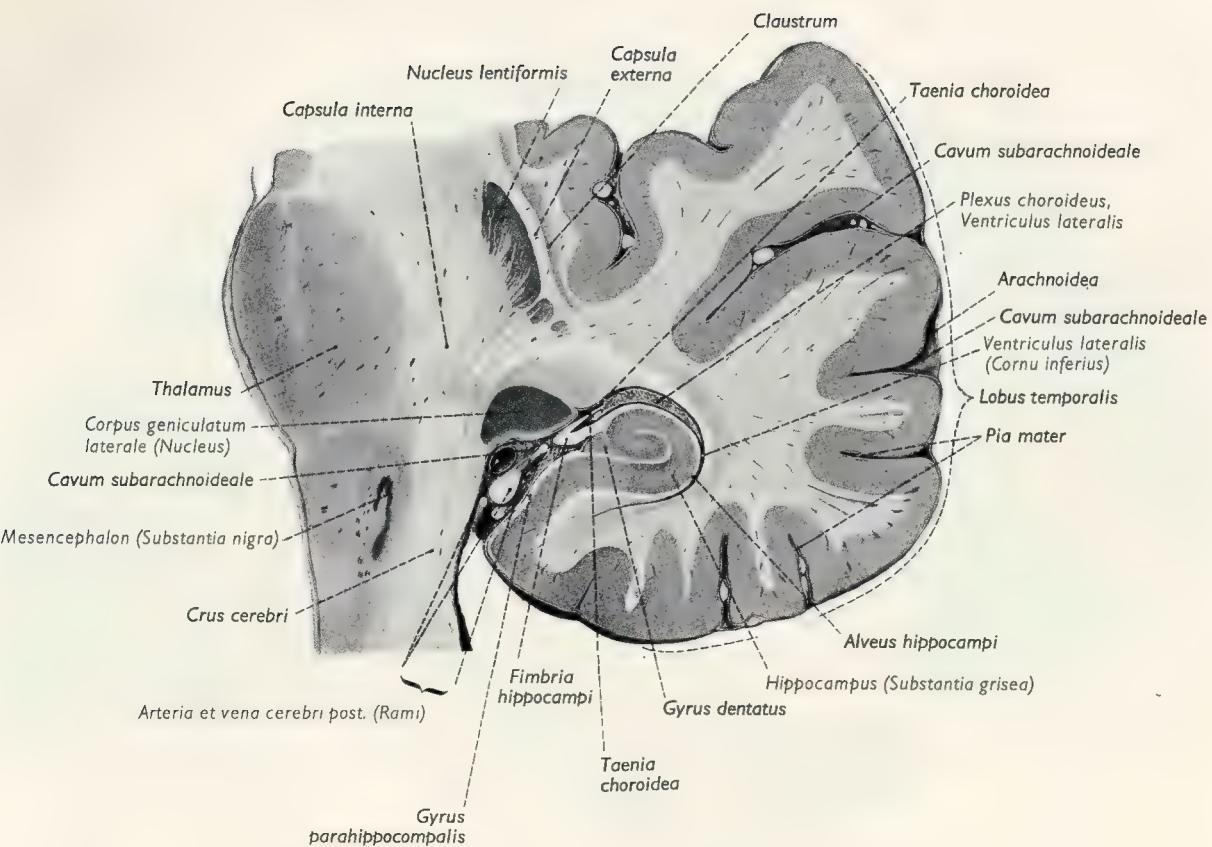
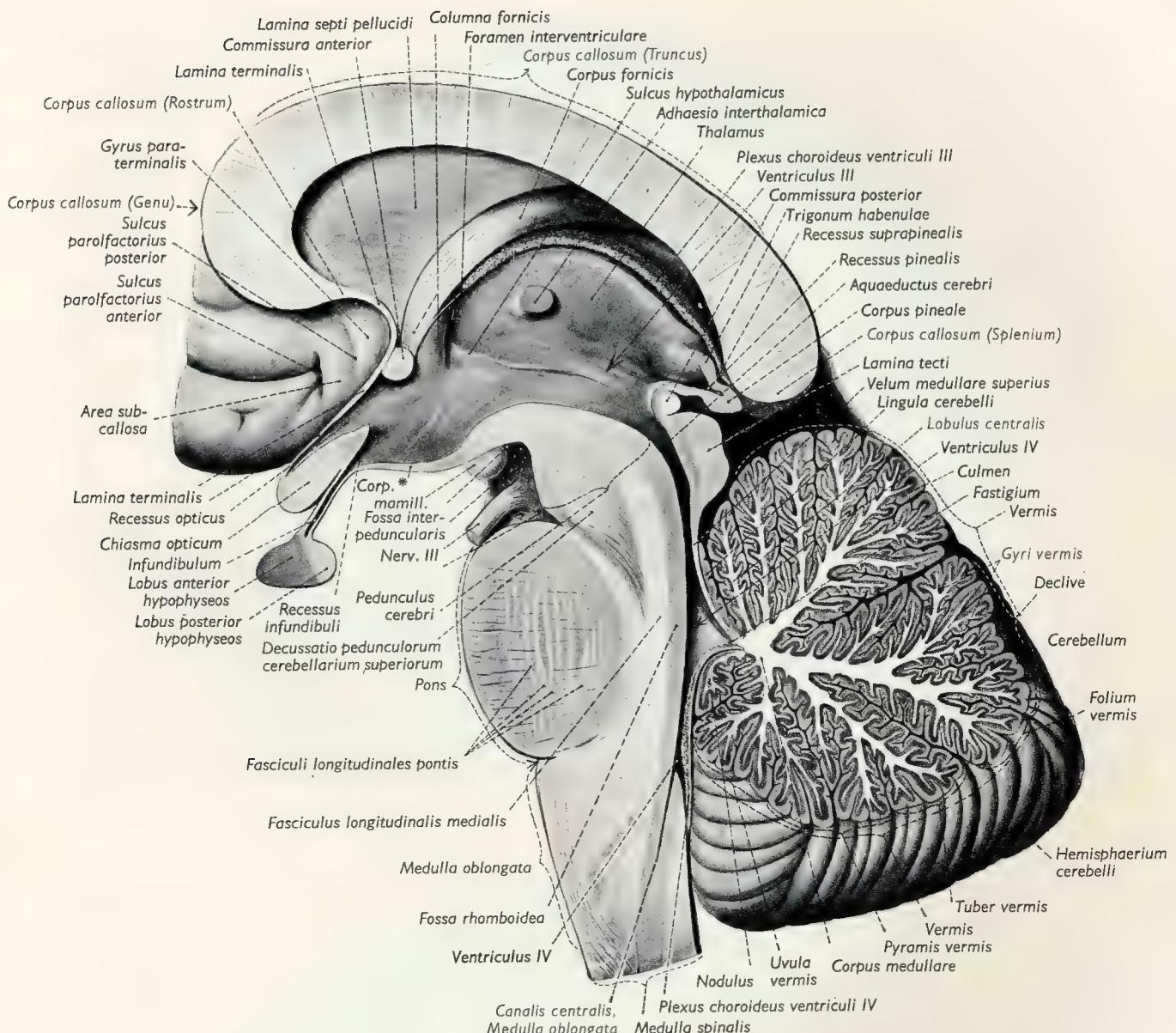


Fig. 126. (Top) Frontal section through the temporal lobe. Boundaries of the inferior horn of the lateral ventricle (from Sobotta/Becher).

Fig. 127. (Bottom) Frontal section through the lateral ventricles, the third ventricle, corpus callosum, fornix and hypothalamus at the level of the mamillary bodies (from Sobotta/Becher).



* = Tuber cinereum

Fig. 128. Median section through the brainstem. Cut surface of the right half. The walls of the third and fourth ventricles as well as the cerebral aqueduct are yellow (from Sobotta/Becher).

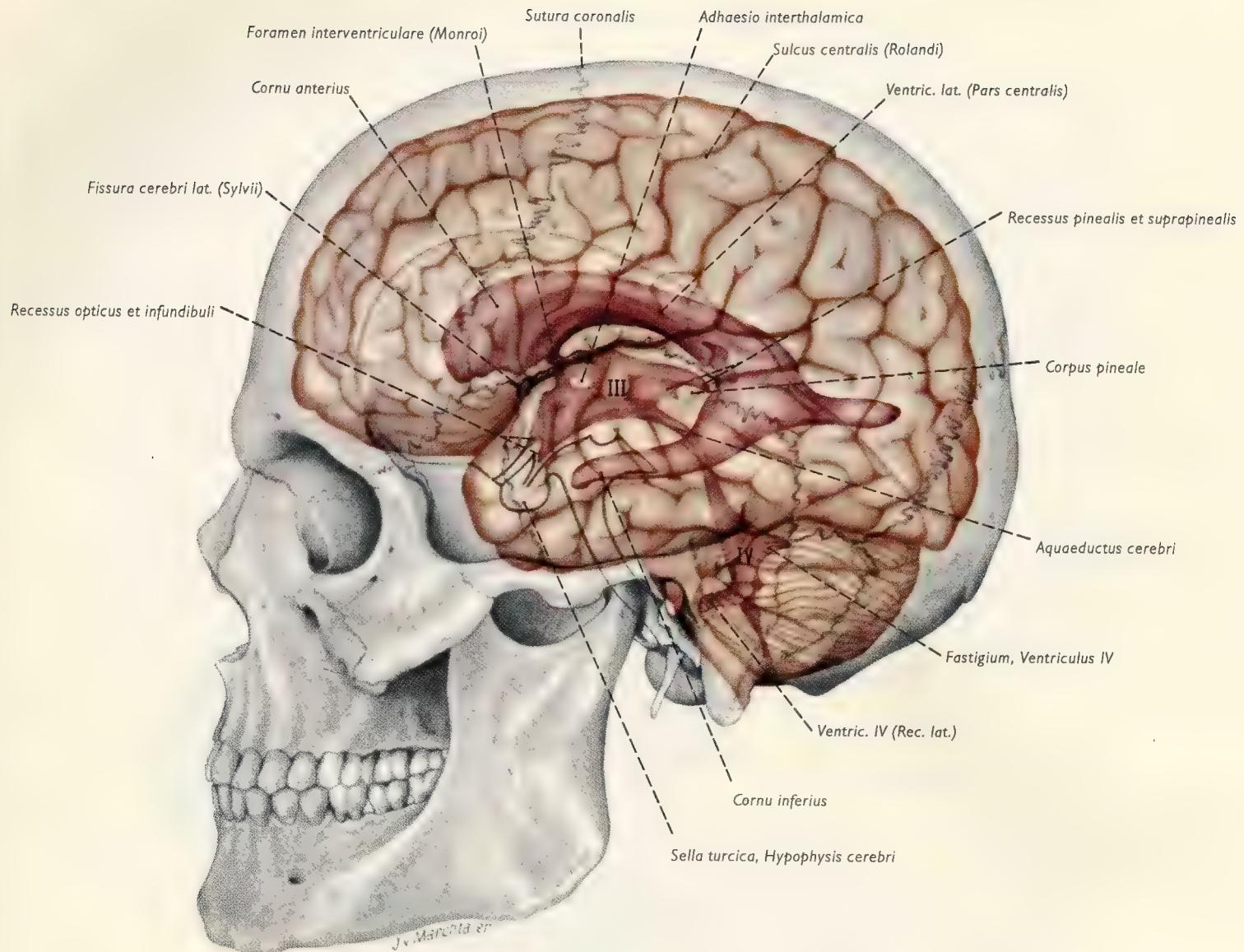
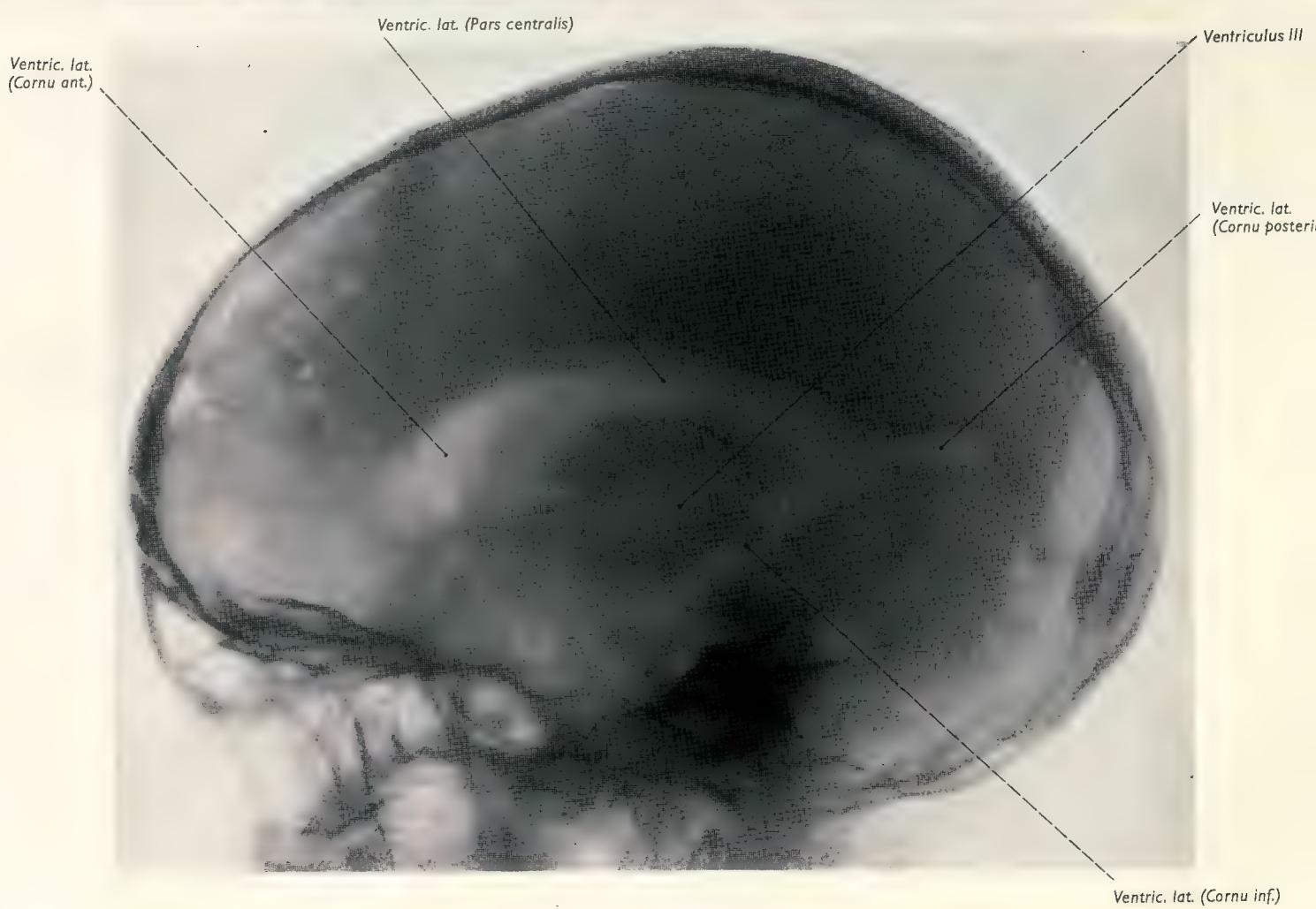
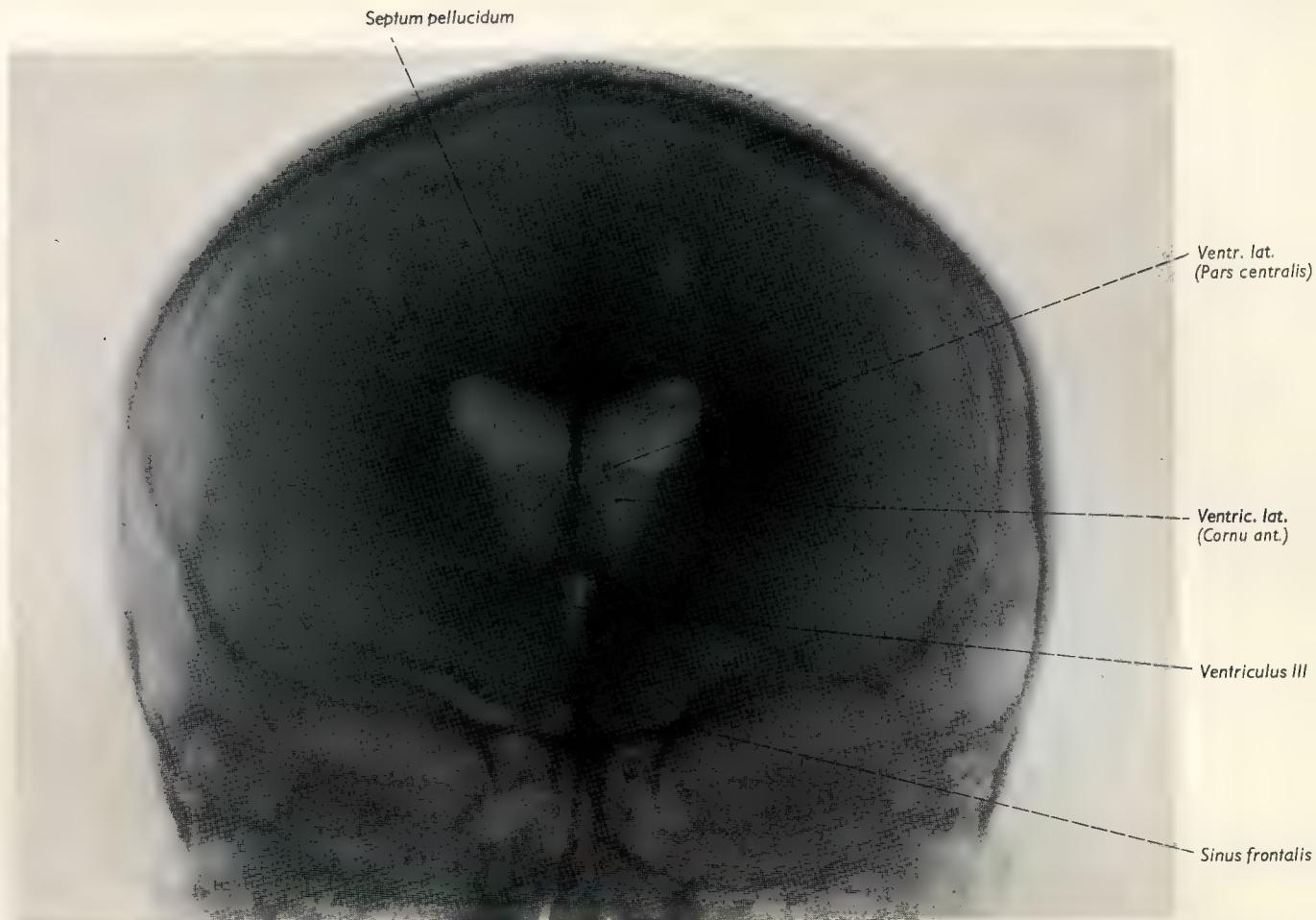


Fig. 129. The ventricular system and its topographical relationships within the brain and the bony skull. Normally the anterior horn does not extend anteriorly beyond the coronal suture. The inferior outline of the brainstem as the median contour of the skull base are identified by simple lines (preparation by Ferner/Kautzky).

Fig. 130. (Right, top). Anteroposterior ventriculogram.

Fig. 131. (Right, bottom) Lateral ventriculogram.



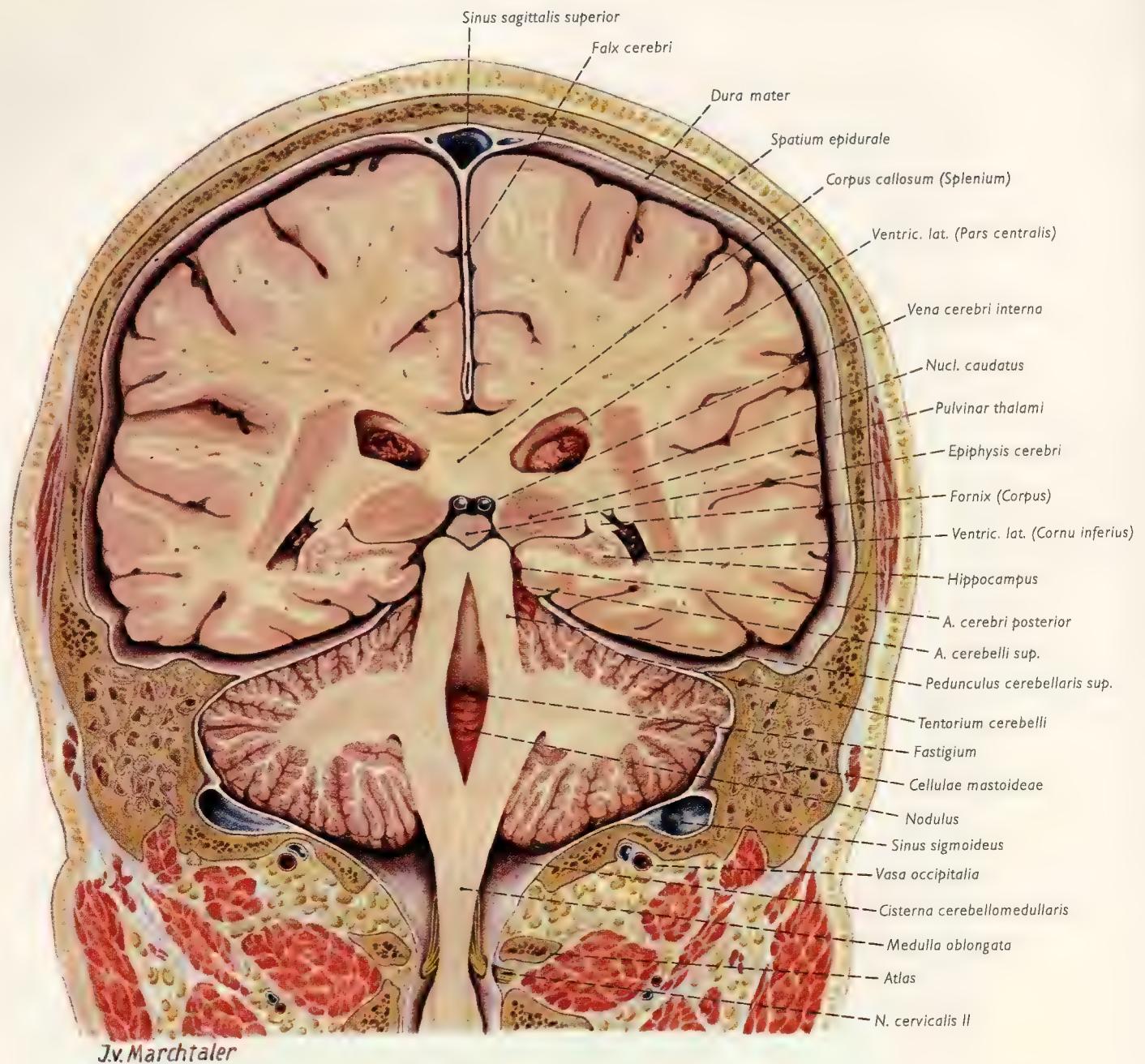
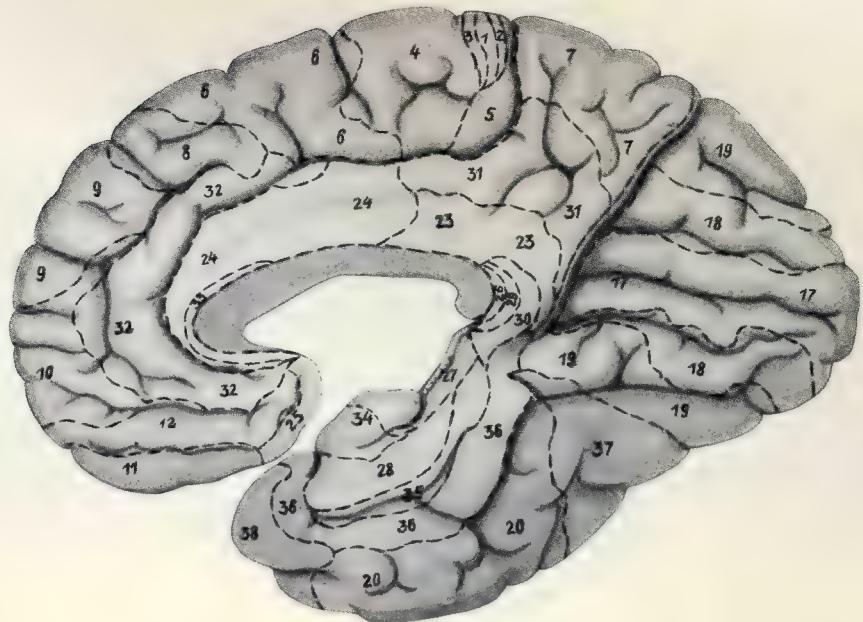


Fig. 132. Frontal section through the brain at the level of the epiphysis and the superior colliculi. Incomplete compartmentalization by the three radiating dural septa. Dorsal view of the section. The hippocampal gyrus with the posterior cerebral a. lie above the free edge of the tentorium.

Point compression (preparation by Ferner/Kautzky).



a) Convex surface of the left hemisphere

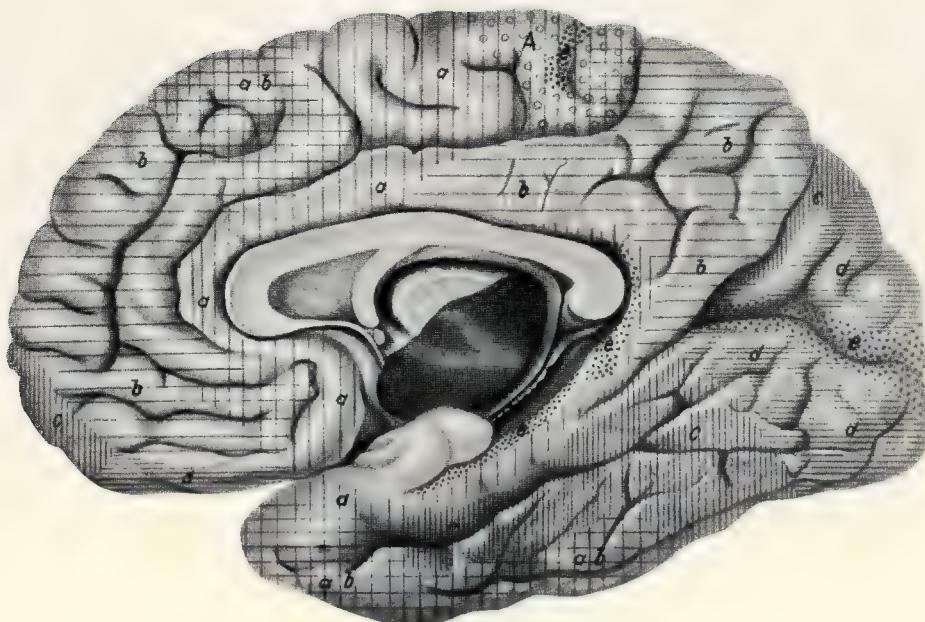


b) Medial surface of the right hemisphere

Fig. 133. Brodmann's cytoarchitectonic cortical areas in man.



a) Convex surface



b) Medial surface

III a = wide cortical layer, agranular, pyramidal type
 §§ A = wide cortical layer, agranular, pyramidal type modified by the presence of giant cells
 ≡ b = medium cortical layer, granular, pyramidal type

田 ab = transitional pyramidal type
 田 c = granular parietal type
 田 d = narrow cortical layer, granular type
 田 e = granular type (koniocortex)

Fig. 134. Distribution of five cytoarchitectonic cortical areas (from v. Economo/Koskinas).

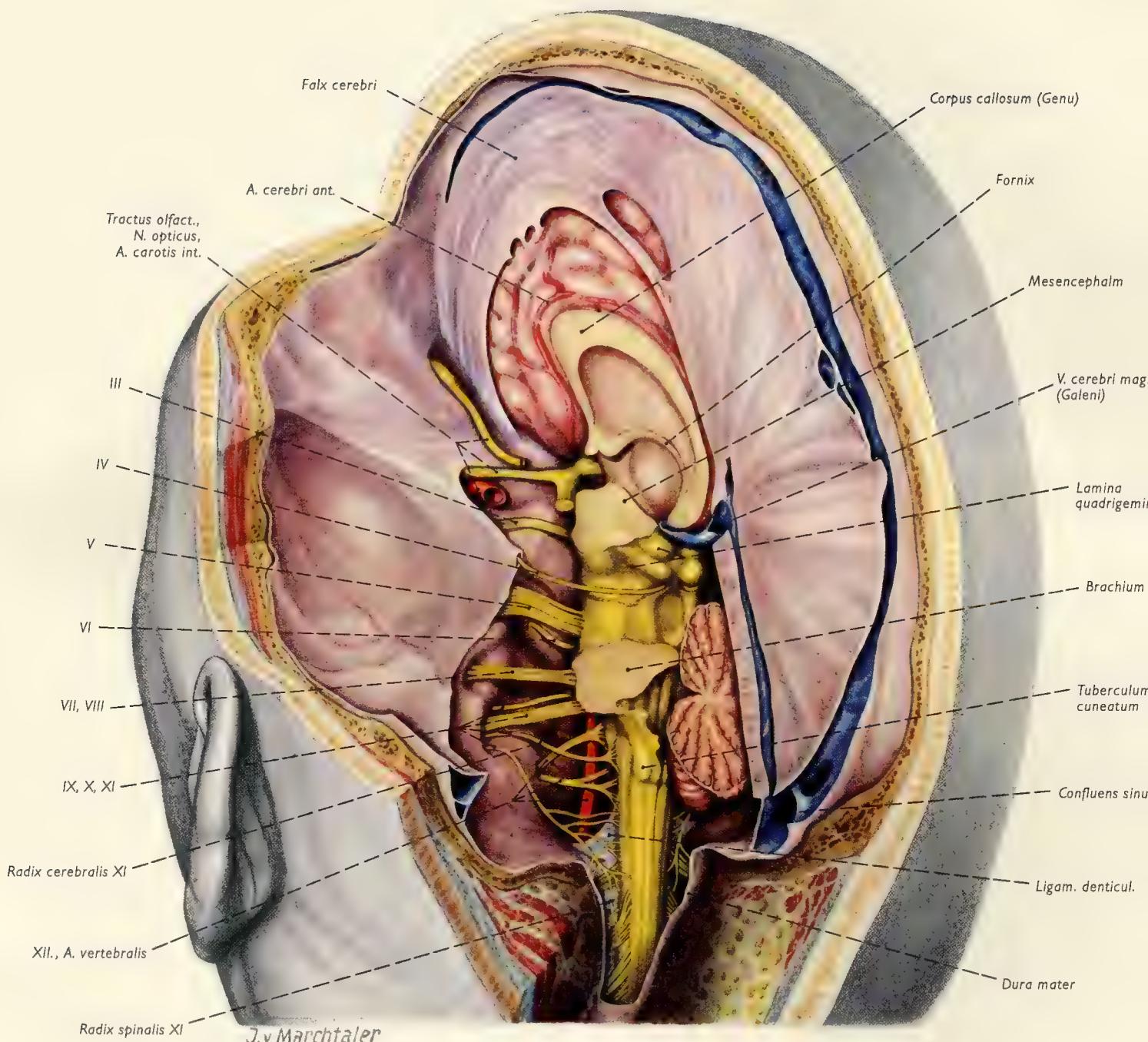
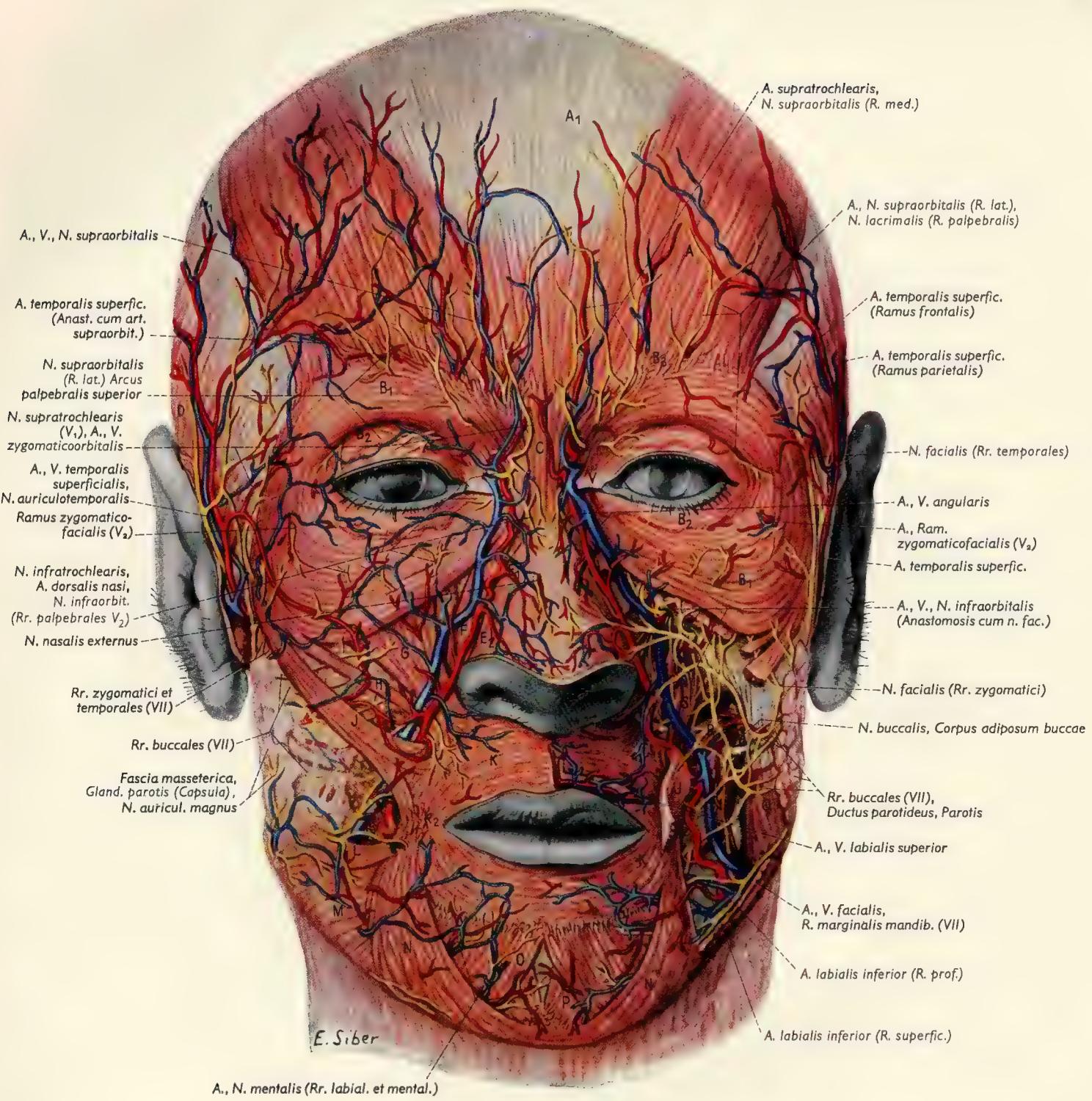


Fig. 135. Brain stem and cranial nerves and their relationship to the base of the skull. The entire leptomeningeal course of the 12 cranial nerves is shown (from Ferner/Kautzky, in: Handbuch der Neurochirurgie, Vol. 1, Berlin-Heidelberg-New York, 1959).

The Face Region



A = M. epicranius
 (Venter frontalis
 m. occipitofrontalis)
A₁ = Galea aponeurotica
B₁ = M. orbicularis oculi
 (Pars orbitalis)
B₂ = M. orbicularis oculi
 (Pars palpebralis)
B₃ = M. corrugator supercilii
C = M. procerus

D = M. temporoparietalis
E₁ = M. nasalis
 (Pars alaris)
E₂ = M. nasalis
 (Pars transversa)
F = M. levator labii
 superioris alaque
 nasi
G = M. levator labii
 superioris

H = M. zygomaticus minor
J = M. zygomaticus major
K = M. orbicularis oris
K₁ = Orig. nasalis
K₂ = Nodus muscularis
L = M. risorius
M = Platysma
N = M. depressor anguli oris
O = M. depressor
 labii inferioris

P = M. mentalis
Q = M. masseter
R = M. buccinator
S = M. levator anguli
 oris
T = M. temporoparietalis
U = Corpus adiposum
 buccae
V = Lig. palpebrale
 mediale

Fig. 136. Mimic musculature, superficial blood vessels, and nerves of the face from front.

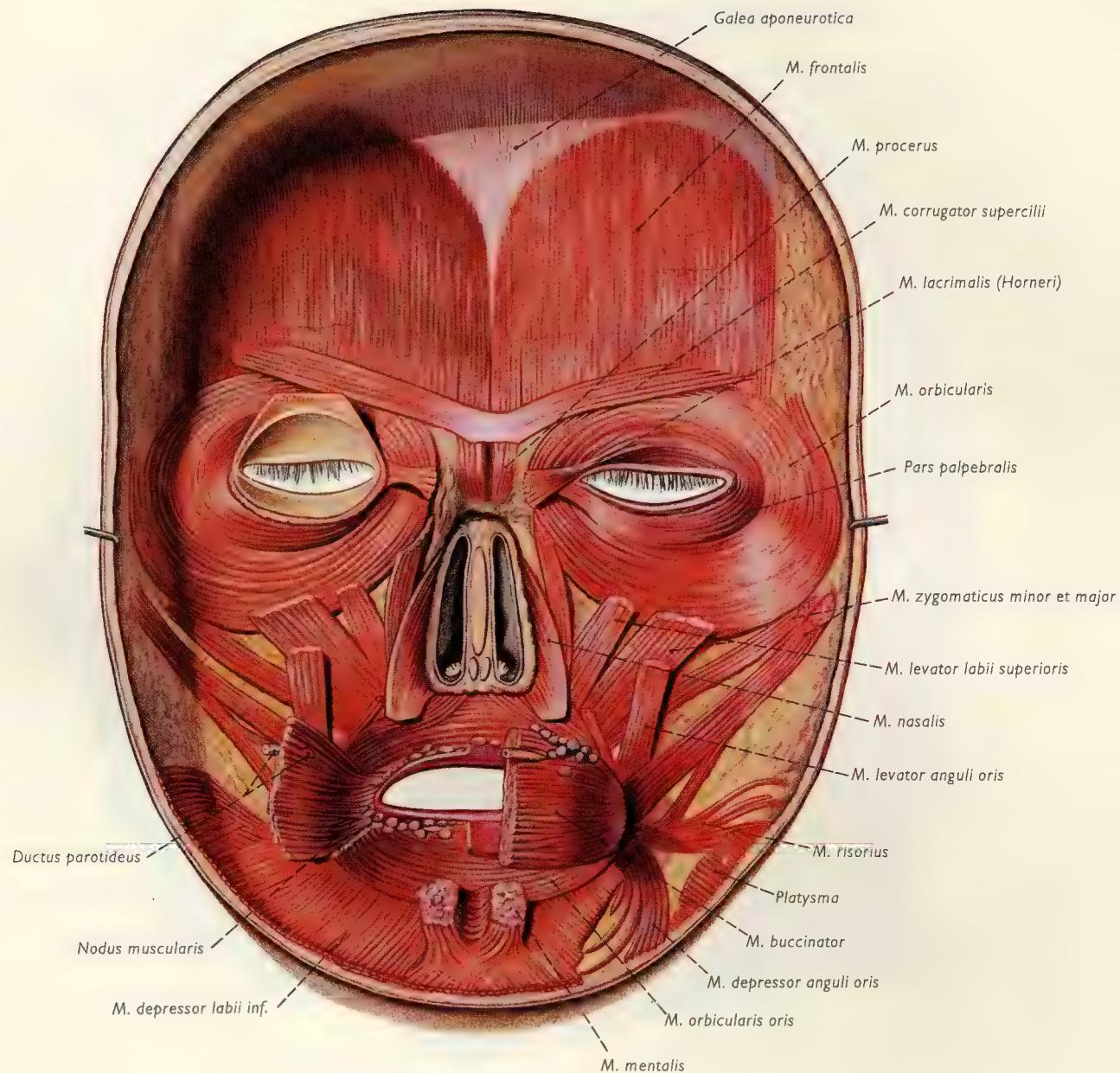


Fig. 137. The mimic musculature removed as a mask and viewed from the skeletal side. The right buccinator muscle has been reflected medially so that its superficial surface may be seen.

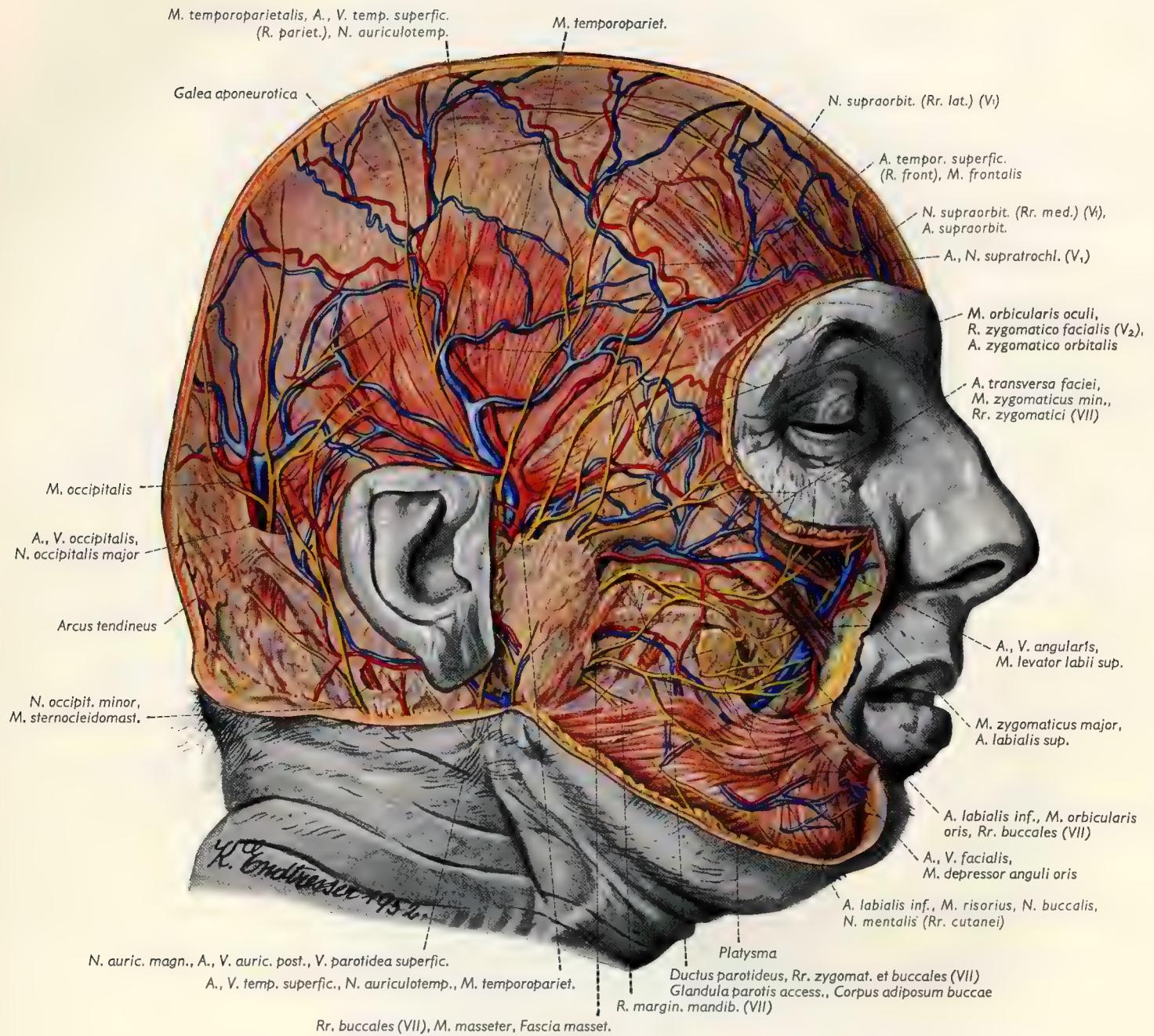
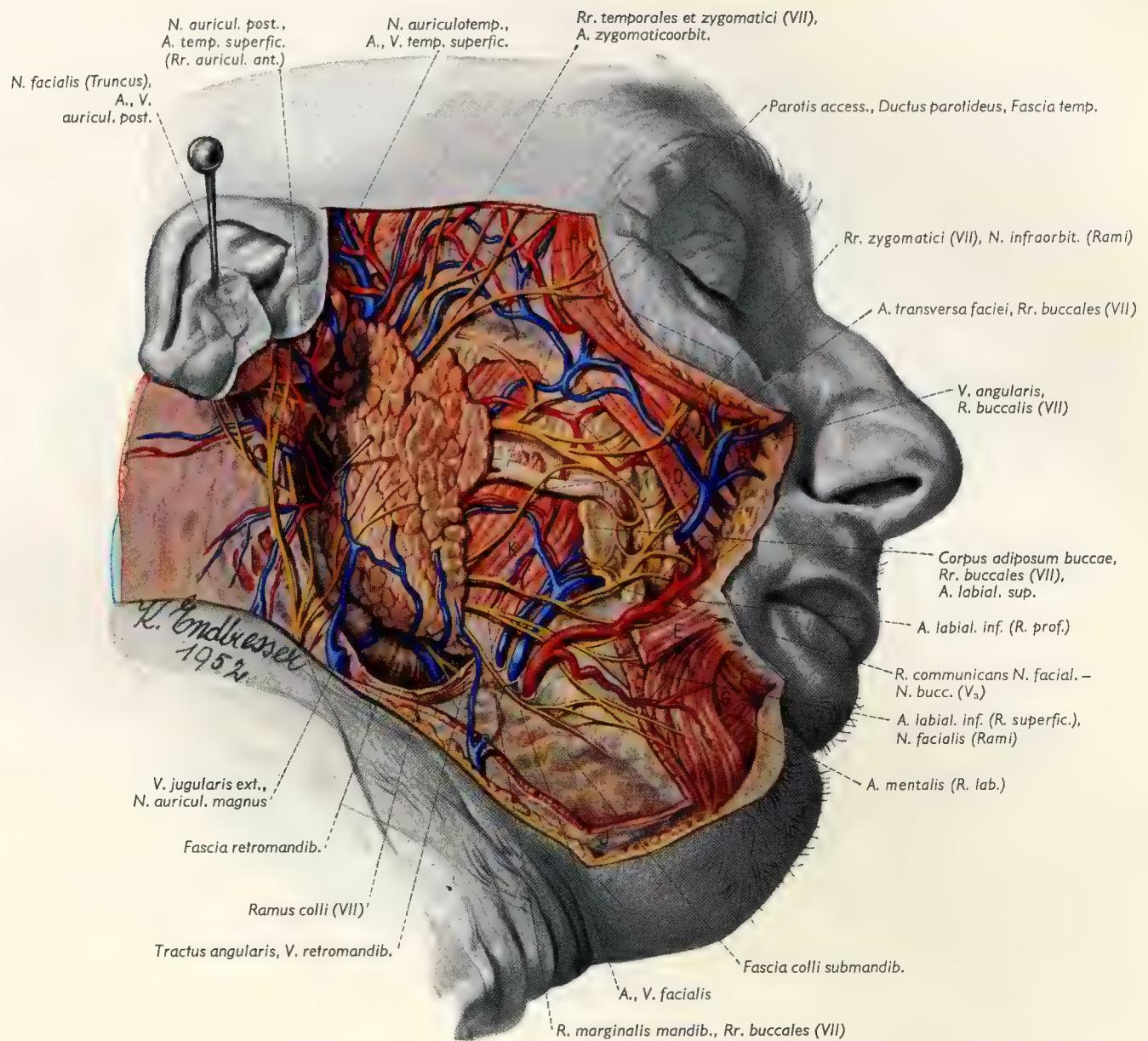


Fig. 138. The superficial blood vessels and nerves of the face and scalp from the side.

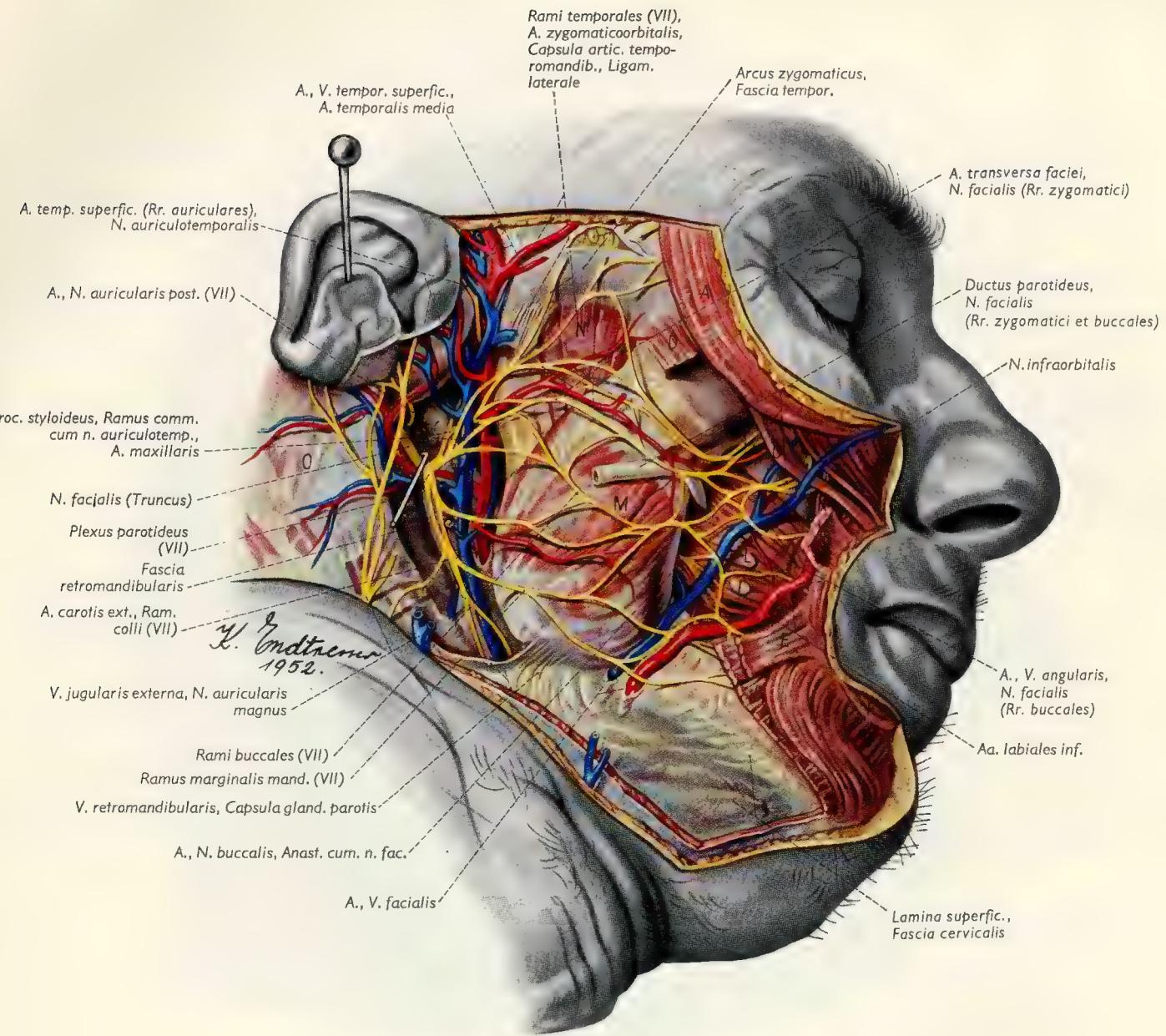


A = M. orbicularis oculi
 B = M. levator labii sup.
 C = M. zygomaticus min.
 D = M. zygomaticus maj.
 E = M. risorius

F = M. orbicularis oris
 G = M. depressor labii inf.
 H = M. depressor anguli oris
 J = Platysma

K = M. masseter
 L = M. sternocleidomastoid.
 M.N = Gl. parotis
 O = Cartilago meatus acust. ext.

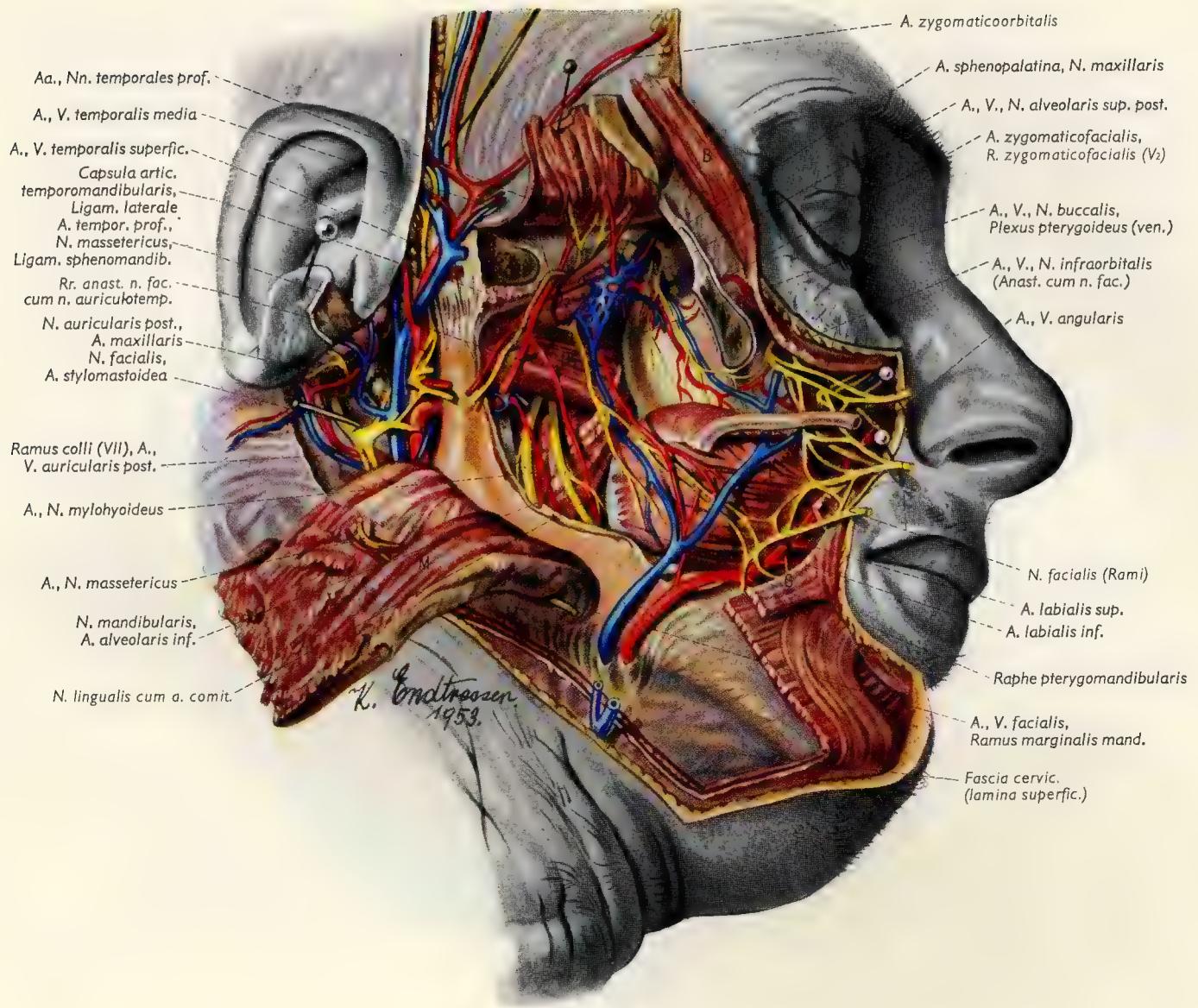
Fig. 139. Blood vessels and nerves in the lateral face region, in the parotid gland and the reteromandibular fossa.



A = M. orbicularis oculi
 B = M. levator labii sup. alaeque nasi
 C = M. zygomaticus minor
 D = M. zygomaticus major
 E = M. risorius
 F = M. orbicularis oris
 G = M. depressor labii inf.
 H = M. depressor anguli oris

J = Platysma
 K = M. levator anguli oris
 L = M. buccinator, Lymphonodi buccales
 M = M. masseter
 N = M. temporalis
 (Pars zygomaticomandibularis)
 O = M. sternocleidomastoideus

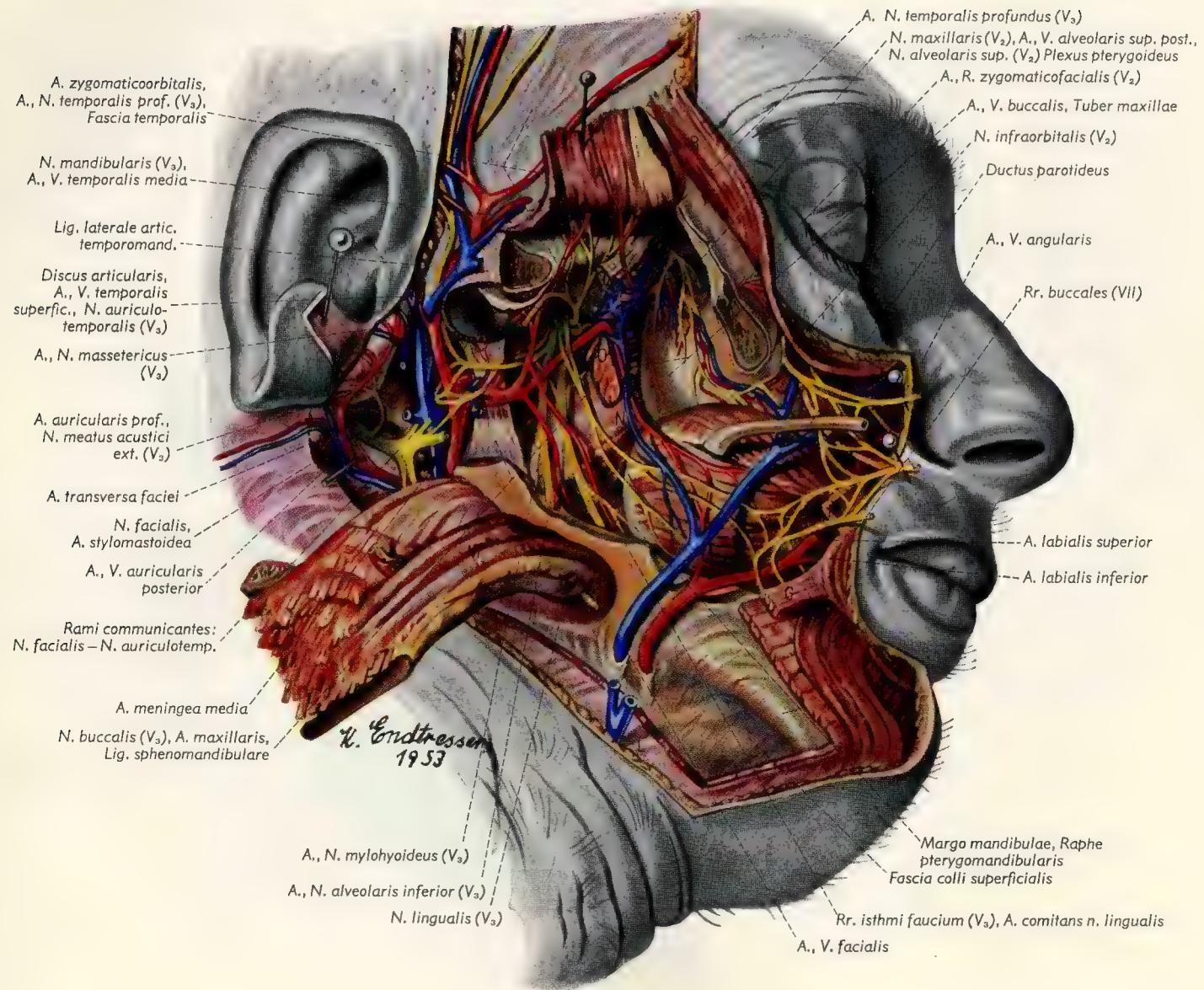
Fig. 140. Superficial vessels, nerves, and muscles of the face; parotid removed. The trunk of the facial nerve has been exposed where it emerges from the stylomastoid foramen. The buccal fat pad is removed.



A = M. temporalis
 B = M. orbicularis oculi
 C = M. levator labii sup. alaeque nasi
 D = M. zygomaticus minor
 E = M. buccinator
 F = M. zygomaticus major
 G = M. risorius
 H = M. depressor anguli oris
 J = M. orbicularis oris

K = M. depressor labii inf.
 L = Platysma
 M = M. masseter
 N = M. pterygoideus medialis
 O₁ = M. pterygoideus lateralis
 (Caput pterygoideum)
 O₂ = M. pterygoideus lateralis
 (Caput infratemporale)
 P = Processus styloideus

Fig. 141. Vessels, nerves, and muscles of the deep facial region, the retromandibular fossa, and the temporomandibular joint. Branches of the facial nerve and the parotid duct have been cut and reflected forward. The coronoid process and part of the ramus of the mandible have been removed.

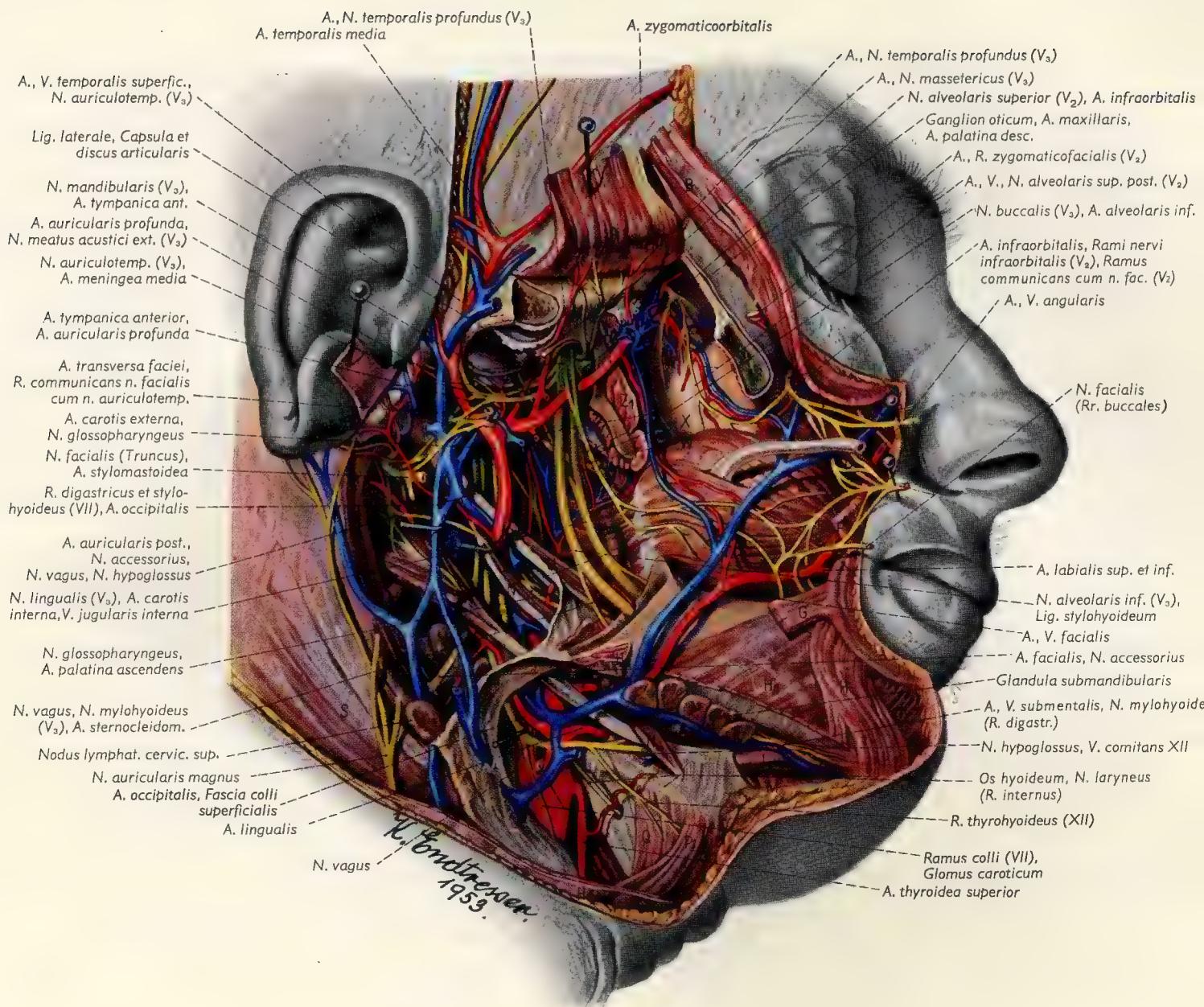


A = M. temporalis
 B = M. orbicularis oculi
 C = M. levator labii superioris
 D = M. zygomaticus minor
 E = M. buccinator

F = M. zygomaticus major
 G = M. risorius
 H = M. depressor anguli oris
 J = M. orbicularis oris
 K = M. depressor labii inferioris
 L = Platysma

M = M. masseter
 N = M. pterygoideus medialis
 O₁ = M. pterygoideus lat.
 O₂ = M. pterygoideus lat.
 P = Processus styloideus

Fig. 142. Blood vessels and nerves in the deep lateral face region (infratemporal and retromandibular fossae).

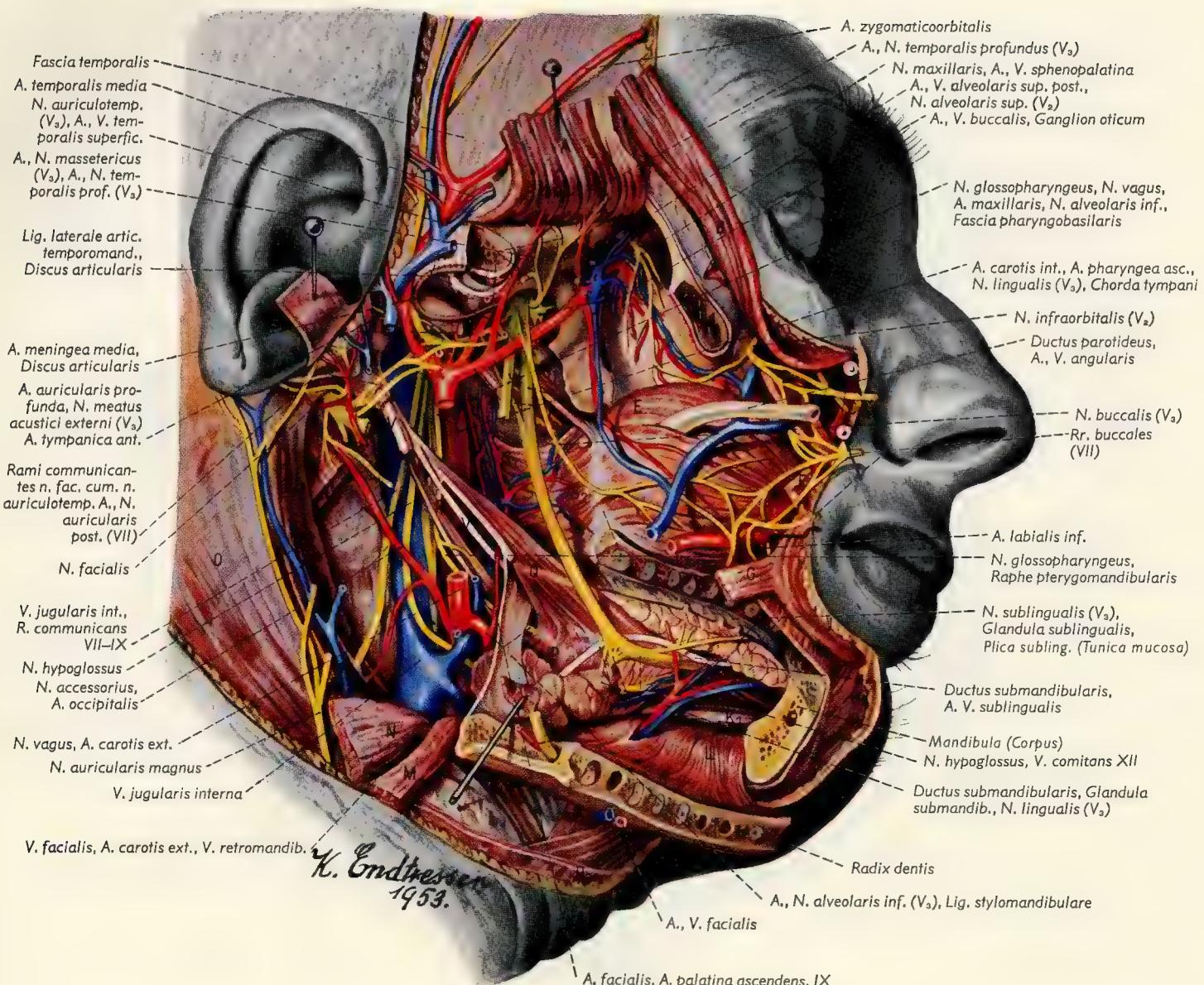


A = M. temporalis
 B = M. orbicularis oculi
 C = M. levator labii sup.
 D = M. zygomaticus minor
 E = M. buccinator
 F = M. zygomaticus major
 G = M. risorius
 H = M. triangularis
 H₁ = Platysma
 H₂ = M. masseter

J = M. orbicularis oris
 K = M. depressor labii inf.
 L = M. digastricus
 M = M. mylohyoideus
 N = M. stylohyoideus
 O = M. sternohyoideus
 P = M. omohyoideus
 Q = M. sternothyroideus
 R = M. constrictor pharyngis inf.
 (M. laryngopharyngeus)
 S = M. sternocleidomastoideus

T = M. digastricus
 U = M. styloglossus
 V = M. constrictor pharyngis sup.
 W = M. levator veli palatini
 X = M. tensor veli palatini
 Y = M. pterygoideus med.
 Z₁ = M. pterygoideus lat.
 (Caput pterygoideum)
 Z₂ = M. pterygoideus lat.
 (Caput infratemporale)

Fig. 143. Deep lateral face region after resection of the ramus of the mandible.



A = M. temporalis
 B = M. orbicularis oculi
 C = M. levator labii sup. alaeque nasi
 D = M. zygomaticus minor
 E = M. buccinator
 F = M. zygomaticus major
 G = M. risorius
 H₁ = M. depressor labii inf.
 H₂ = M. depressor anguli oris
 H₃ = Platysma

J = M. orbicularis oris
 K₁ = M. geniohyoideus
 K₂ = M. genioglossus
 L = M. mylohyoideus
 M = M. stylohyoideus
 N = M. digastricus
 O = M. sternocleidomastoideus
 P = M. hyoglossus
 Q = M. styloglossus

R = M. stylopharyngeus
 S₁ = Pars pterygopharyngea
 S₂ = Pars buccopharyngea } M. constrictor
 S₃ = Pars mylopharyngea } pharyngis sup.
 S₄ = Pars glossopharyngea
 T = M. levator veli palatini
 U = M. tensor veli palatini
 V = Processus styloideus,
 Lig. stylohyoideum

Fig. 144. Blood vessels and nerves in the infratemporal, retromandibular, and submandibular fossae after removal of the right half of the mandible.

Visceral Compartments of the Head

Nose and Paranasal Sinuses

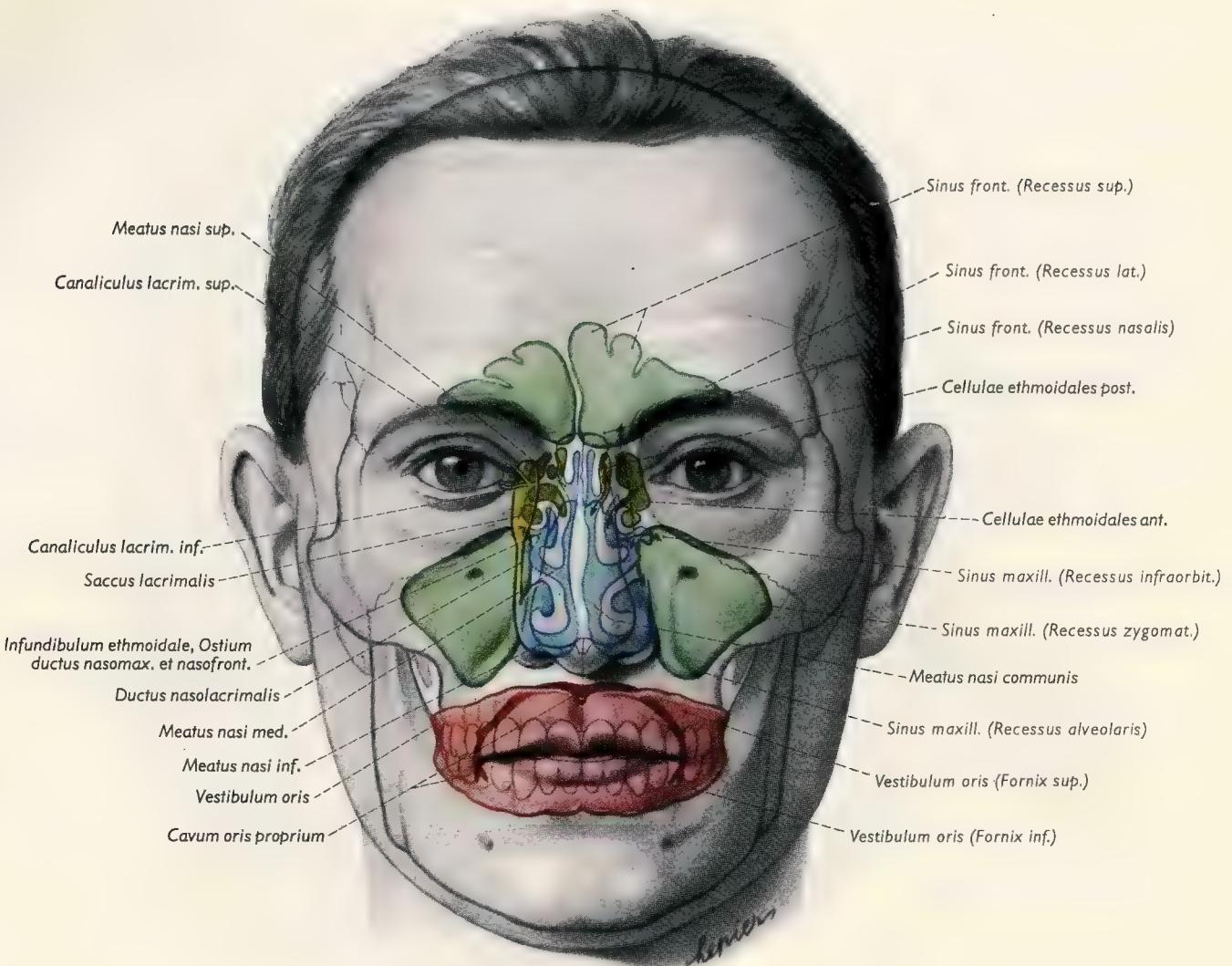
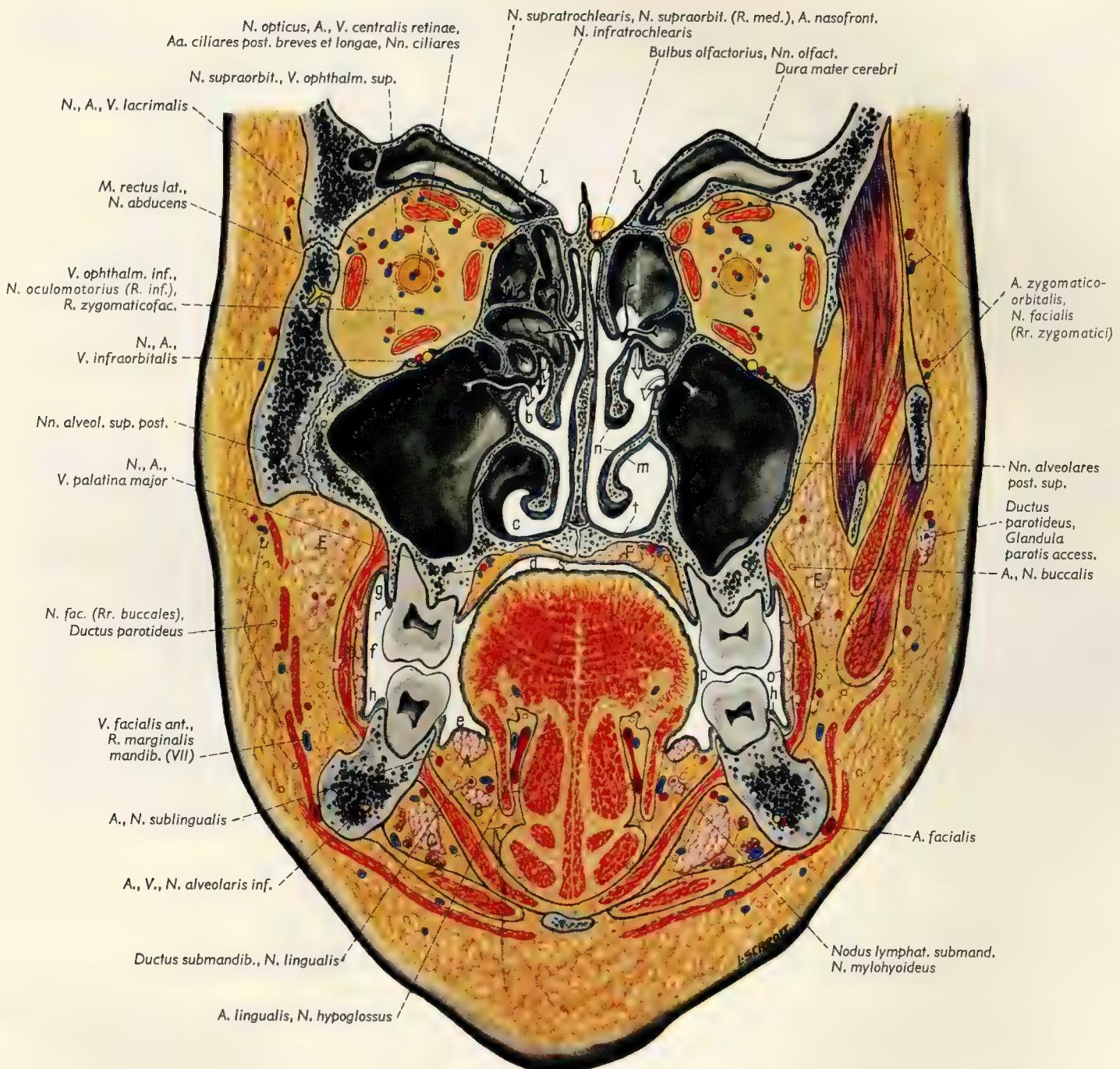


Fig. 145. Sagittal projection of the visceral compartments of the head seen from front. The outlines of the oral and nasal cavities as well as the paranasal sinuses are indicated in different colors.

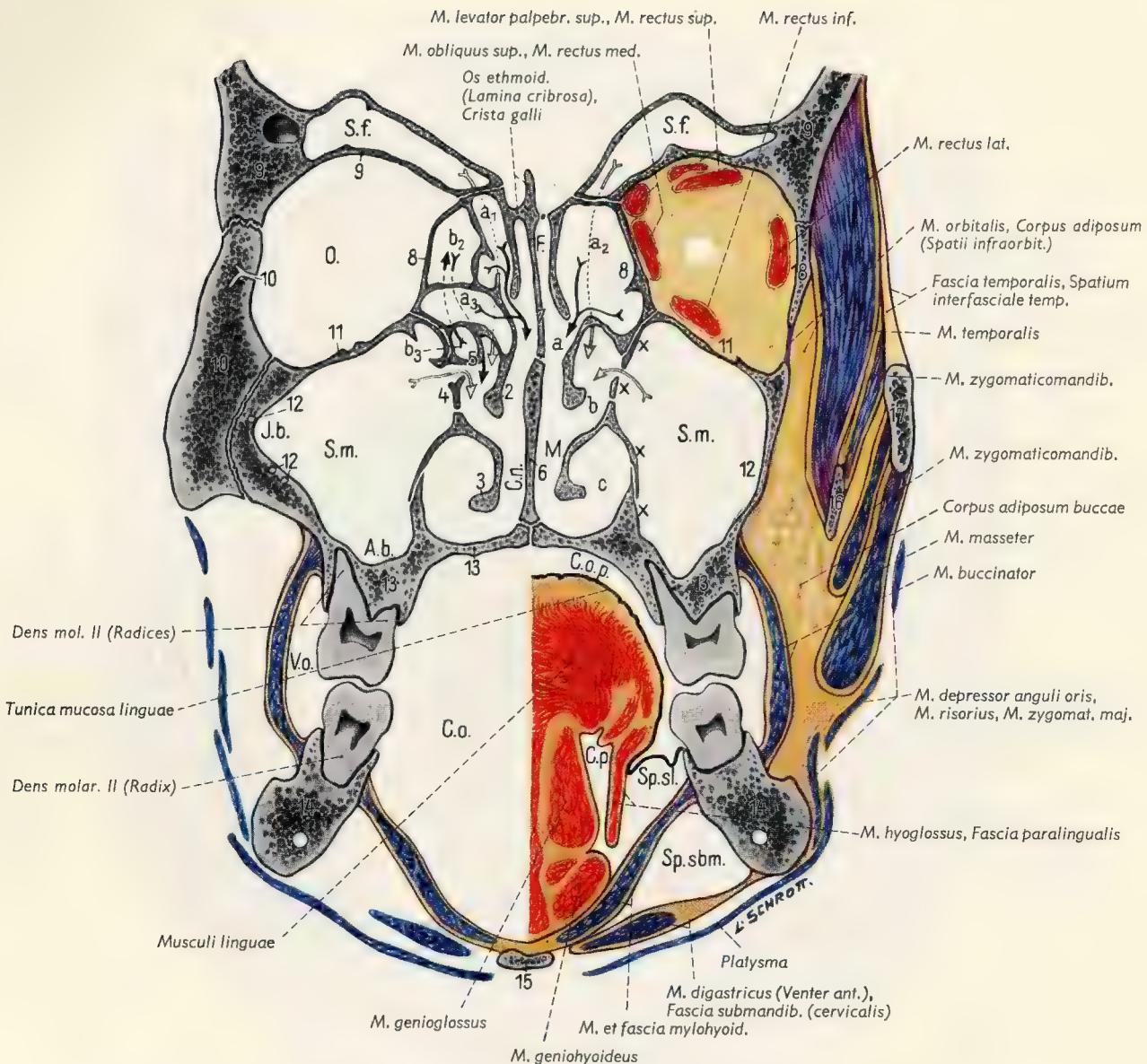


- a = Meatus nasi sup.
- b = Meatus nasi med.
- c = Meatus nasi inf.
- d = Cavum oris proprium
- e = Area sublingualis, Plica subling.
- f = Vestibulum oris
- g = Fornix sup.
- h = Fornix inf.
- i = Infundibulum ethmoidale

k = Ductus nasomaxill.
 l = Ductus nasofrontalis
 m = Mucosa conchae inf.
 n = Mucosa conchae inf. et med.
 o = Mucosa vestibuli oris
 p = Mucosa linguae
 r = Gingiva propria
 s = Mucosa palati
 t = Cavum nasi, Mucosa propria

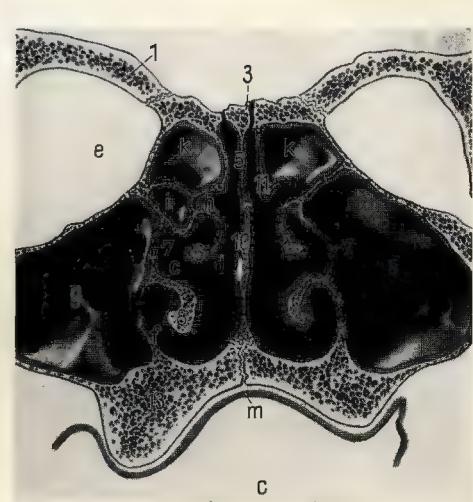
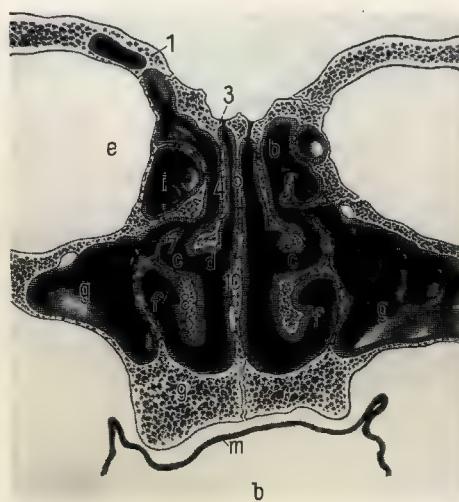
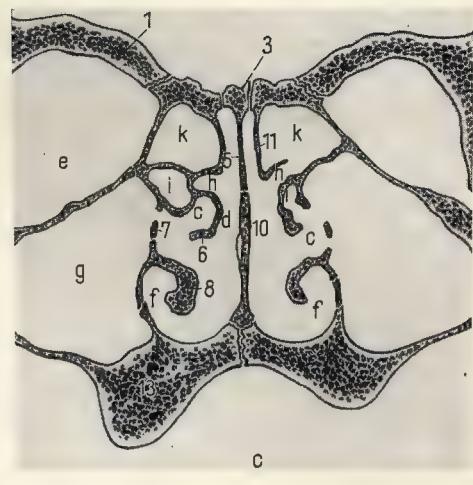
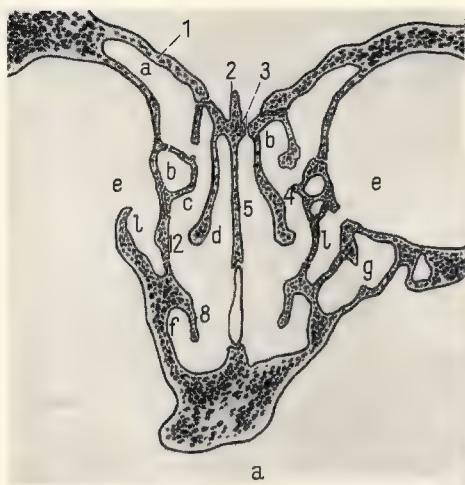
- A = Glandula subling.
- B = Glandula submandib.
(Proc. uncinatus)
- C = Glandula submandib.
- D = Glandulae buccales
- E = Corpus adiposum buccae
- F = Glandulae palatinæ

Fig. 146. Retrobulbar frontal section through the facial skeleton. In the mouth and nose regions the cut goes through the second molar. Section viewed from behind.



a = Meatus nasi sup.	C.n. = Cavum nasi	Sp.sbm. = Spatium submandib.	10 = Os zygomatic. (Facies orbit.)
b = Meatus nasi med.	C.o. = Cavum oris	V.o. = Vestibulum oris	Foramen zygomatico orbit.
c = Meatus nasi inf.	C.o.p. = Cavum oris proprium	1 = Concha nasalis sup.	11 = Maxilla, Sulus infraorbit.
a ₁ , a ₂ , a ₃ = Cellulae ethmoid.	C.p. = Spatium paralinguale	2 = Concha nasalis med.	12 = Processus zygomatic.,
post.	F = Fissura olfactoria	3 = Concha nasalis inf.	Canaliculi alveol. sup. post.
b ₂ , b ₃ = Cellulae ethmoid. ant.	J.b. = Recessus zygomat.	4 = Processus uncinatus	13 = Maxilla (Processus alveol.
x - x = Lamina orbitalis,	sinus maxill.	5 = Bulla ethmoidalis	et palat.)
Processus uncinatus,	M = Meatus nasi comm.	6 = Vomer	14 = Corpus mandibulae
Processus maxillaris	O = Orbita	7 = Os ethmoidale	15 = Os hyoideum
conchae inf., Facies	S.f. = Sinus frontalis	(Lamina perpendicularis)	16 = Mandibula (Proc.
nasalis maxillae	(Recessus orbit.)	8 = Lamina orbitalis	coronoideus)
A.b. = Recessus alveol.	S.m. = Sinus maxillaris	9 = Os frontale (Pars orbit.	17 = Arcus zygomaticus
sinus maxill.	Sp.sl. = Spatium sublinguale	et processus zygomat.)	18 = Os sphenoidale (Ala major)

Fig. 147. Frontal section of the musculoskeletal apparatus of the nose and mouth regions.
The cut passes through the second molar. Viewed from behind.



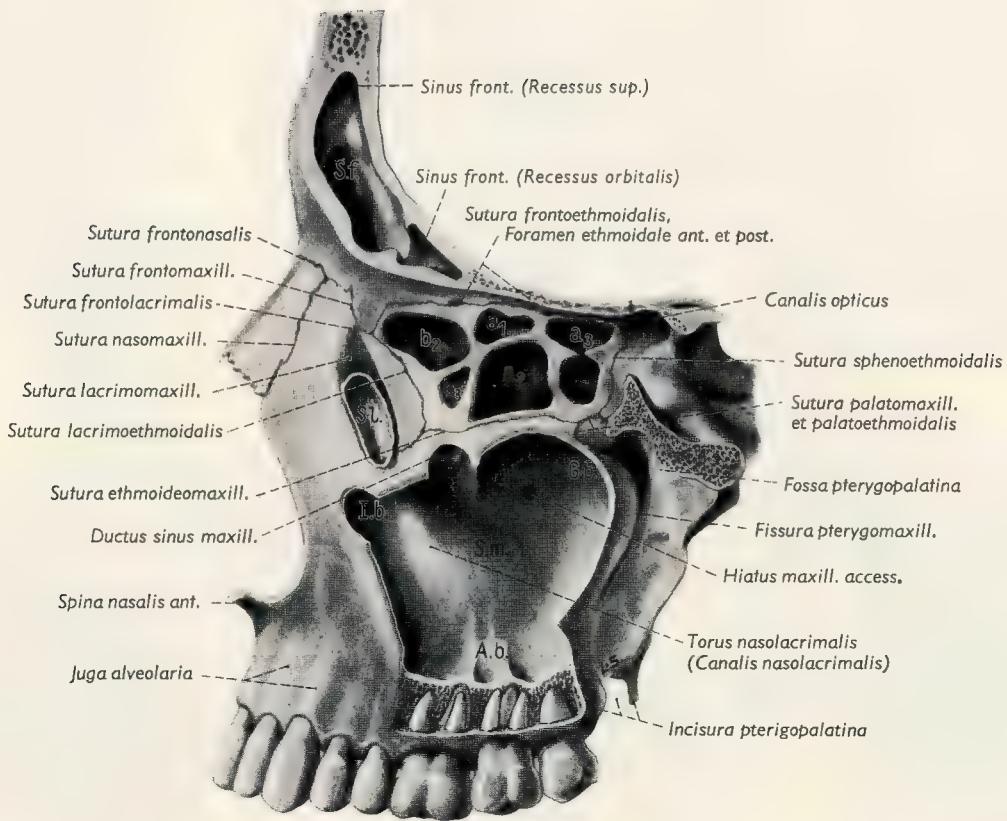
a = Sinus frontalis
 b = Cellulae ethmoid. ant.
 c = Meatus nasi medius
 d = Meatus nasi communis
 e = Orbita
 f = Meatus nasi inferior
 g = Sinus maxilla
 h = Meatus nasi superior
 i = Bulla ethmoidalis
 k = Cellulae ethmoid. post.

1 = Canalis nasolacrimalis
 m = Palatum, Tunica mucosa
 1 = Os frontale
 2 = Crista galli
 3 = Lamina cribrosa
 4 = Os ethmoidale
 (Lamina conchalis)
 5 = Lamina mediana
 6 = Concha nasalis media

7 = Proc. uncinatus
 8 = Concha nasalis
 inferior
 9 = Maxilla
 (Processus palatinus)
 10 = Vomer
 11 = Concha nasalis
 superior
 12 = Os lacrimale
 13 = Os palatinum

Fig. 148. Frontal sections through the bony framework of the nasal cavity, the ethmoidal air cells, and the maxillary sinus. Sections a, b, and c were made through the anterior, middle, and posterior thirds of the nasal cavity respectively.

Fig. 149. (Middle) Frontal sections through the nasal cavity, the ethmoidal air cells, and the maxillary sinus showing mucosal relationships.



a₁ = posterior superior ethmoidal cells
 a₂ = posterior middle ethmoidal cells
 a₃ = posterior inferior ethmoidal cells
 b₂ = anterior middle ethmoidal cells
 b₃ = anterior inferior ethmoidal cells
 A.b. = alveolar recess of maxill. sinus
 with alveolar juga formed
 by roots of the molars

G.b. = palatine recess of maxill. sinus
 I.b. = infraorbital recess of maxill. sinus
 S.f. = frontal sinus
 S.l. = lacrimal sac (opened)
 S.m. = nasal wall of maxill. sinus covered
 by mucosa

Fig. 150. Lateral view of the air-filled spaces in the region of the nose (paranasal sinuses).

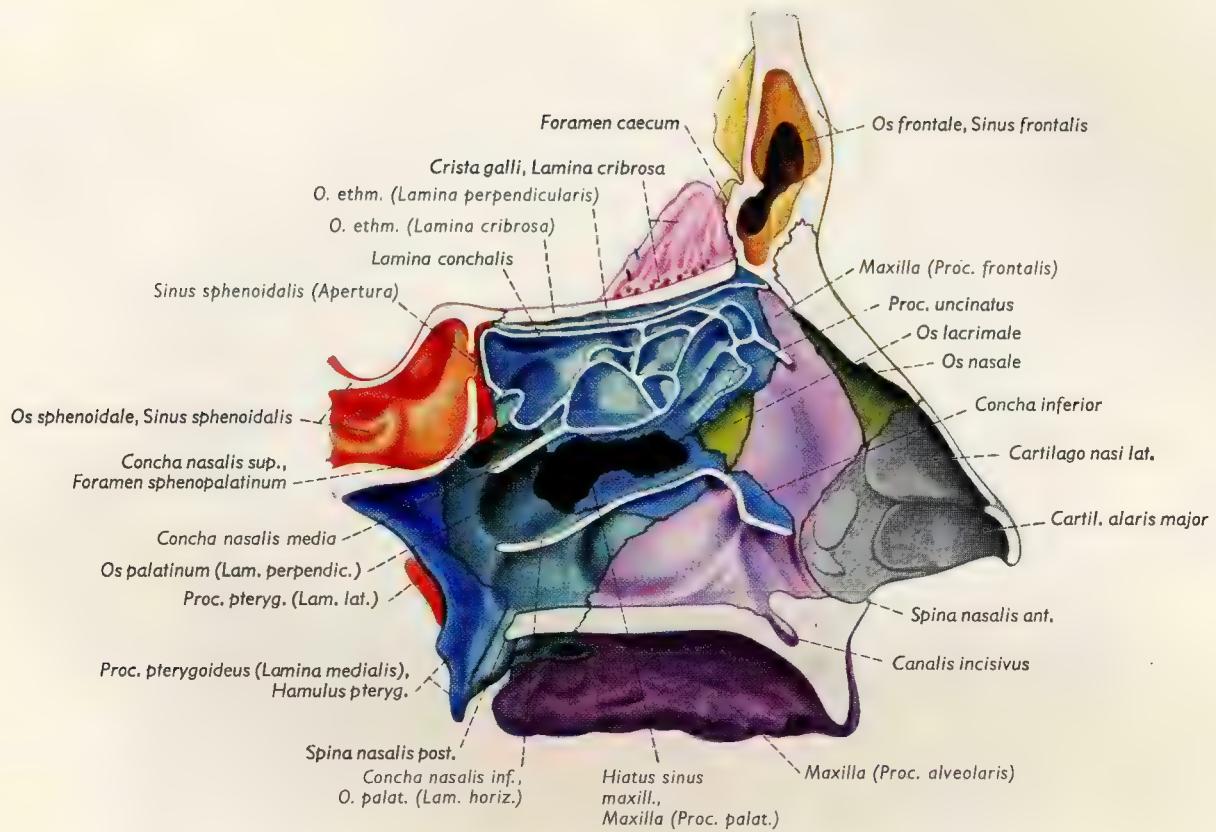


Fig. 151. The bony framework of the lateral nasal wall (bones shown in different colors). The nasal conchae have been removed. The cut edges are white.

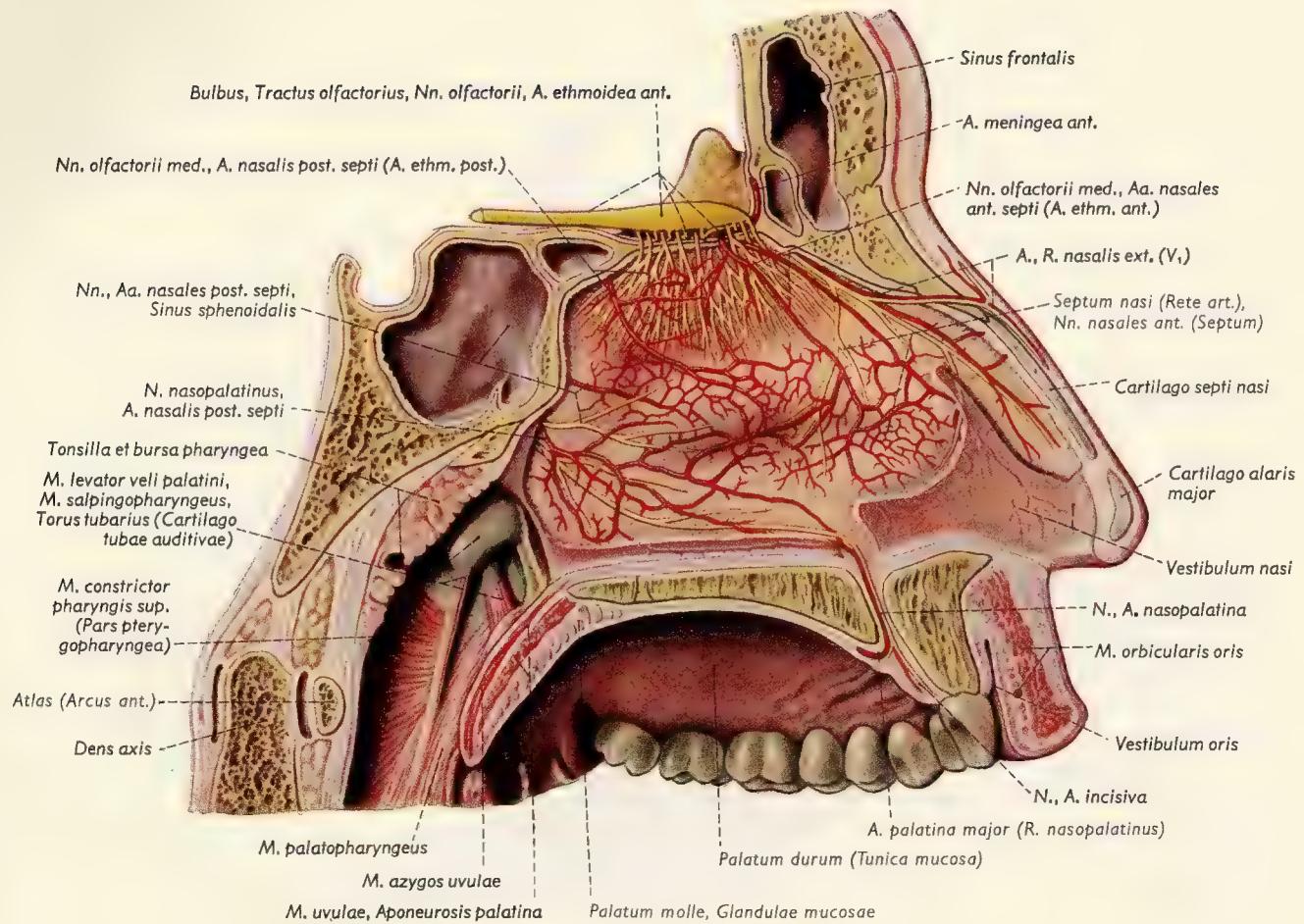
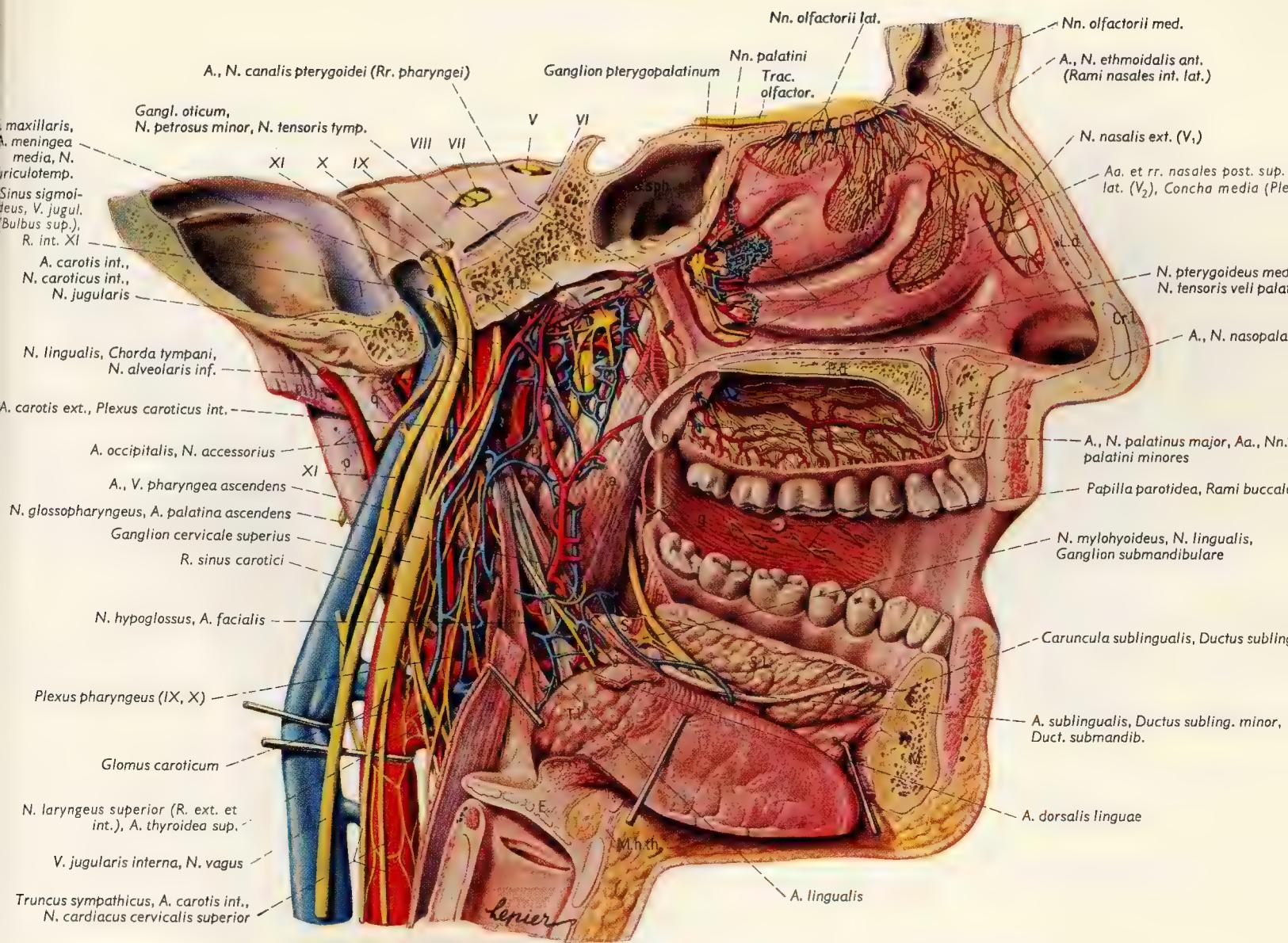


Fig. 152. Arteries and nerves in the region of the nasal septum (mucosa removed).
Musculature of nasopharynx.



Cl = Clivus

Cr. l. = Cartilago apicis nasi, Crus lat.

E. = epiglottis with hyoepiglottic lig.

L. d. = Cartilago septodorsalis, Lamina dorsi

M. = Mandibula

a = M. pterygoideus med.

b = pterygoid hamulus with tendon of tensor veli palat. m.

M. constrictor pharyngis sup. (cut):

c = Pars pterygopharyngea

d = Pars buccopharyngea

e = Pars pterygopharyngea

j = Pars glossopharyngea

I-XII = cranial nerves

M.h.th. = Membrana hyochoyoidea

P. = Parotis

P. d. = Palatum durum

S. = Glandula submandibularis

S. f. = Sinus frontalis (Os frontale)

f = M. tensor veli palat. (cut)

g = M. bucinatorius

h = M. mylohyoideus

i = M. palatoglossus (cut)

k = M. styloglossus

l = M. constrictor pharyngis medius (cut)

m = M. stylopharyngicus

S. I. = Glandula sublingualis

S. sph. = Sinus sphenoides (Os sphenoides)

T.b. = auditory tube with tensor and levator veli palat. m. (origin)

T. l. = Tonsilla lingualis

n = M. pharyngopalat. (cut)

o = M. sternocleidomastoideus

p = m. splenius capitis (insertion)

q = M. biventer (venter mastoid.)

r = Lig. sphenomandibulare

s = M. genioglossus

t = M. orbicularis oris

u = Lig. stylomandibulare

Fig. 153. Median section of the head showing blood vessels, nerves, and muscles.

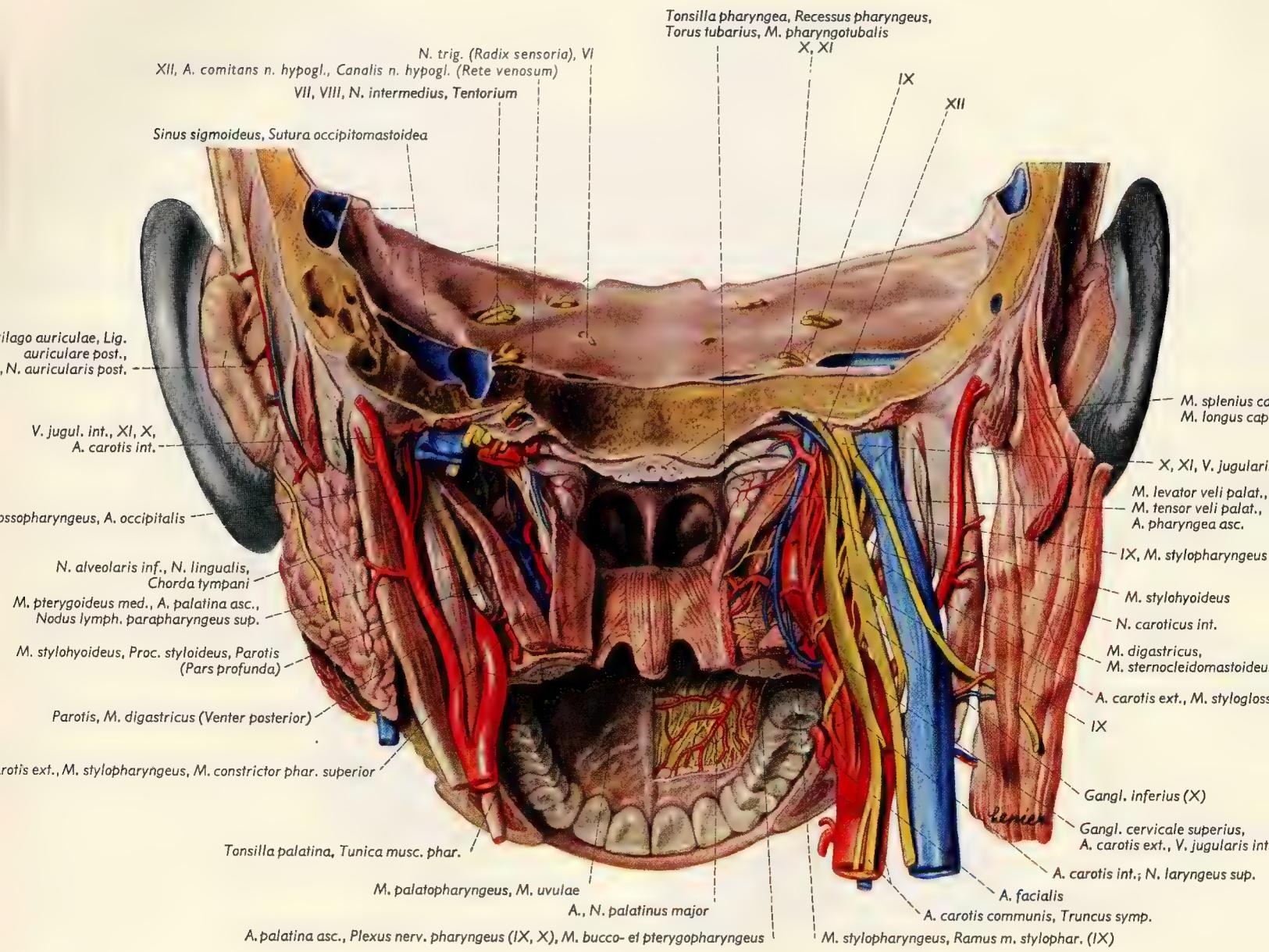


Fig. 154. Parapharyngeal vessels, nerves, and muscles at the base of the skull.
Dorsal view of the choanae and the palate.

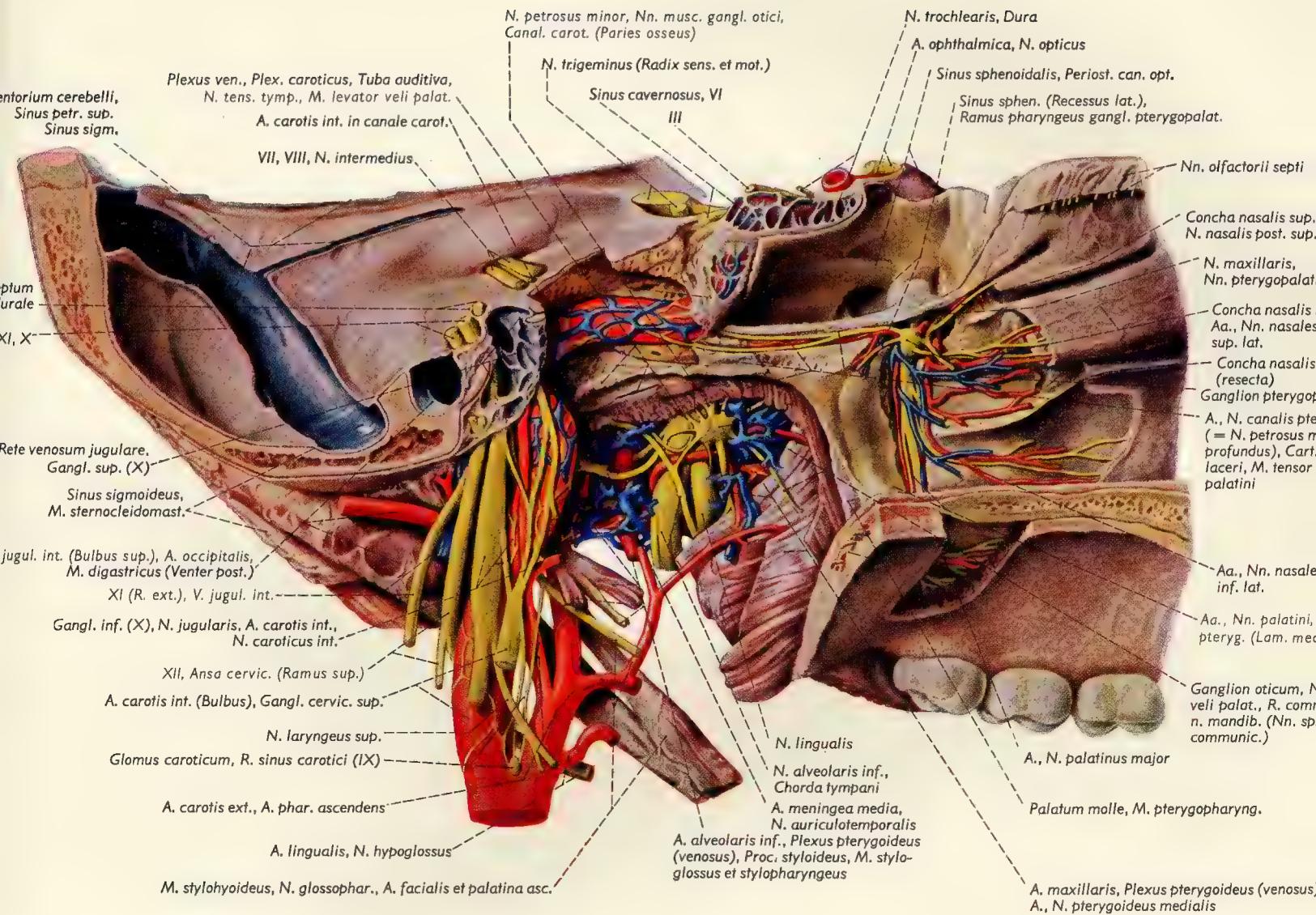


Fig. 155. Blood vessels and nerves in the region of the pterygopalatine fossa, the parapharyngeal spaces, and the lateral wall of the nasal cavity; medial view. The carotid and pterygoid canals have been opened.

Oral Cavity and Teeth

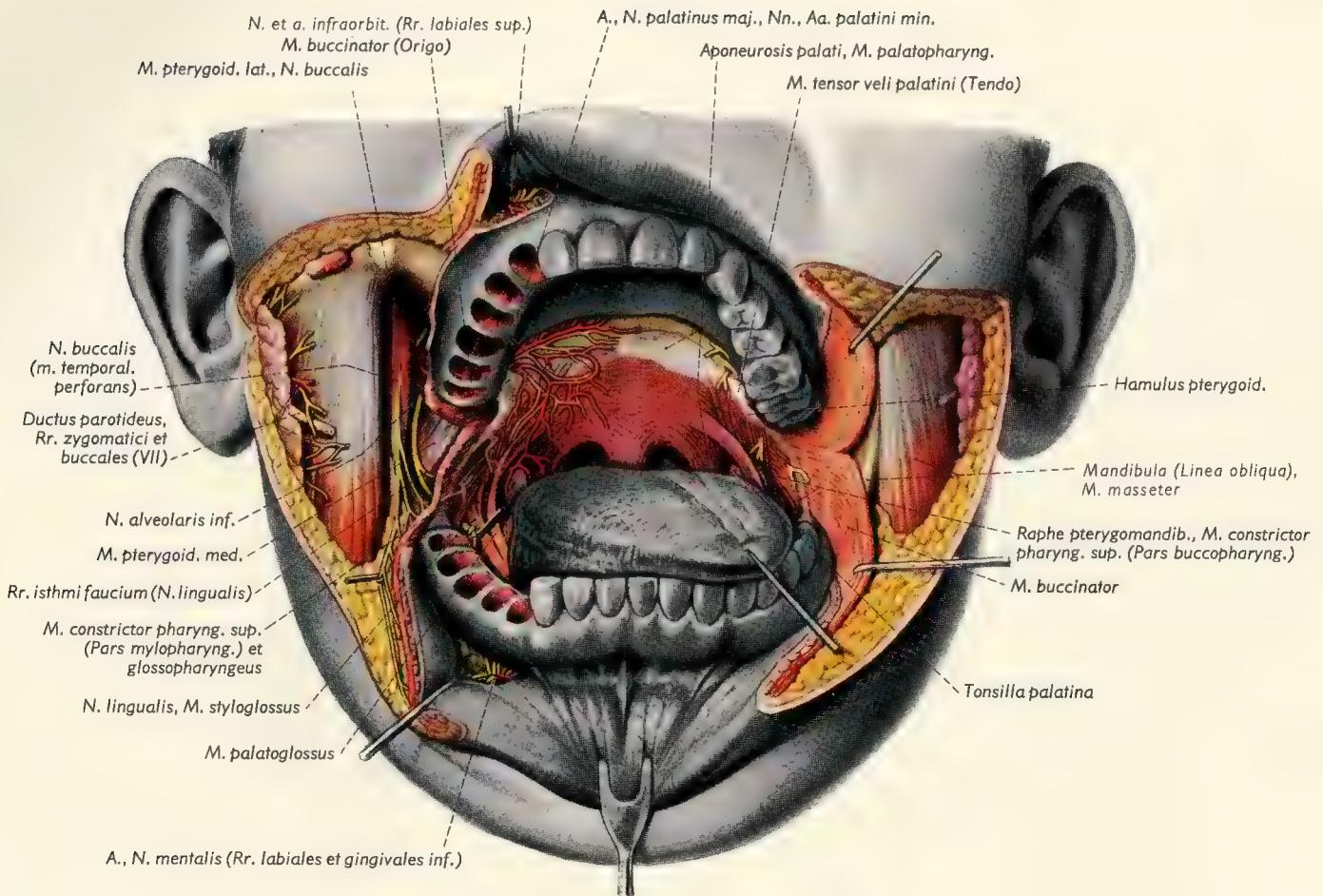


Fig. 156. Vessels and nerves of the oral cavity seen from front. The buccinator muscle has been partly removed on the right side in order to expose the deep muscles of mastication and the nerves of the infratemporal fossa. The lingual nerve on the right side has been elevated from its deep position in the angle between the mylopharyngeal and glossopharyngeal parts of the superior pharyngeal constrictor.

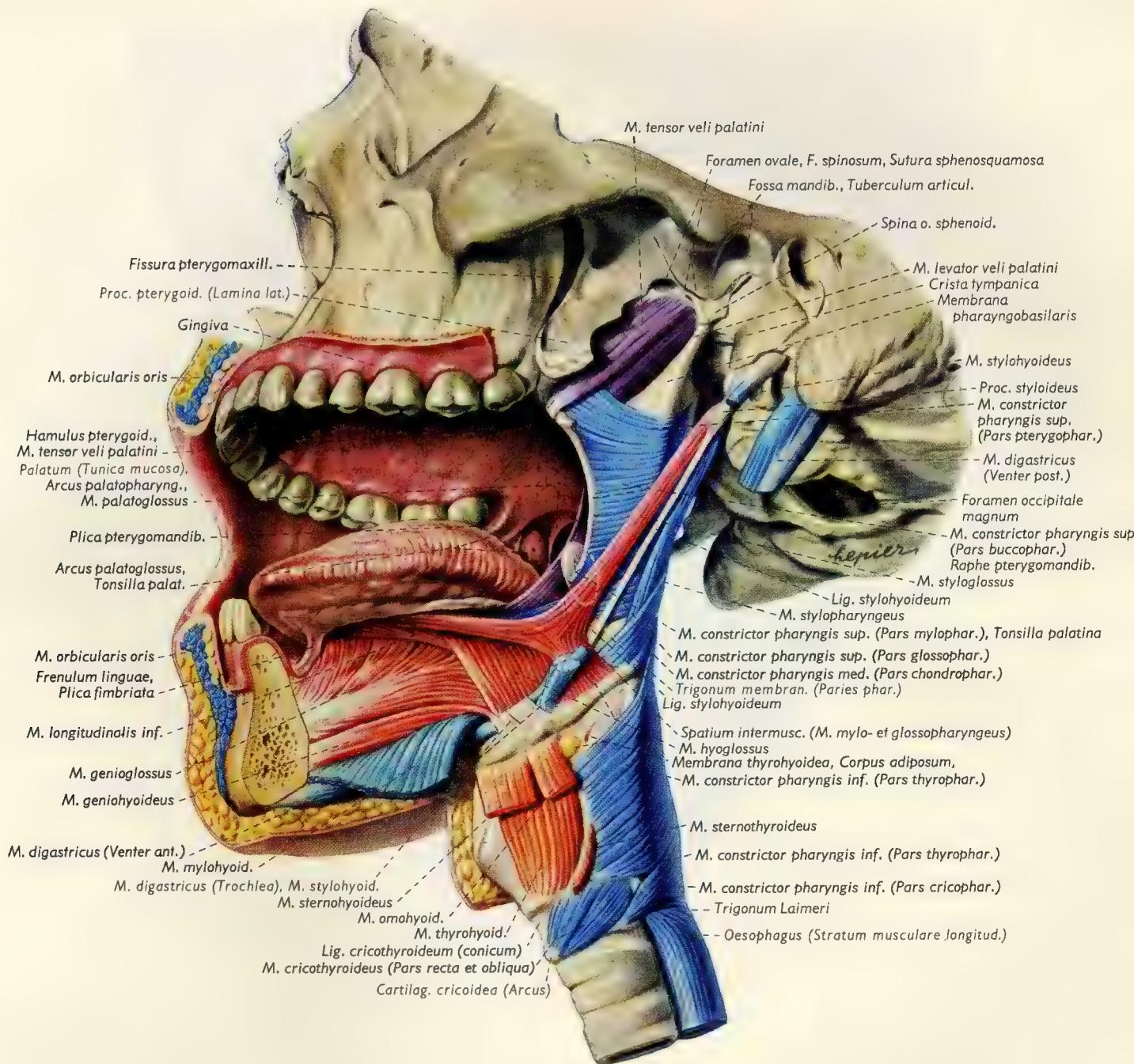


Fig. 157. Musculature of the sublingual region and pharynx; lateral view.

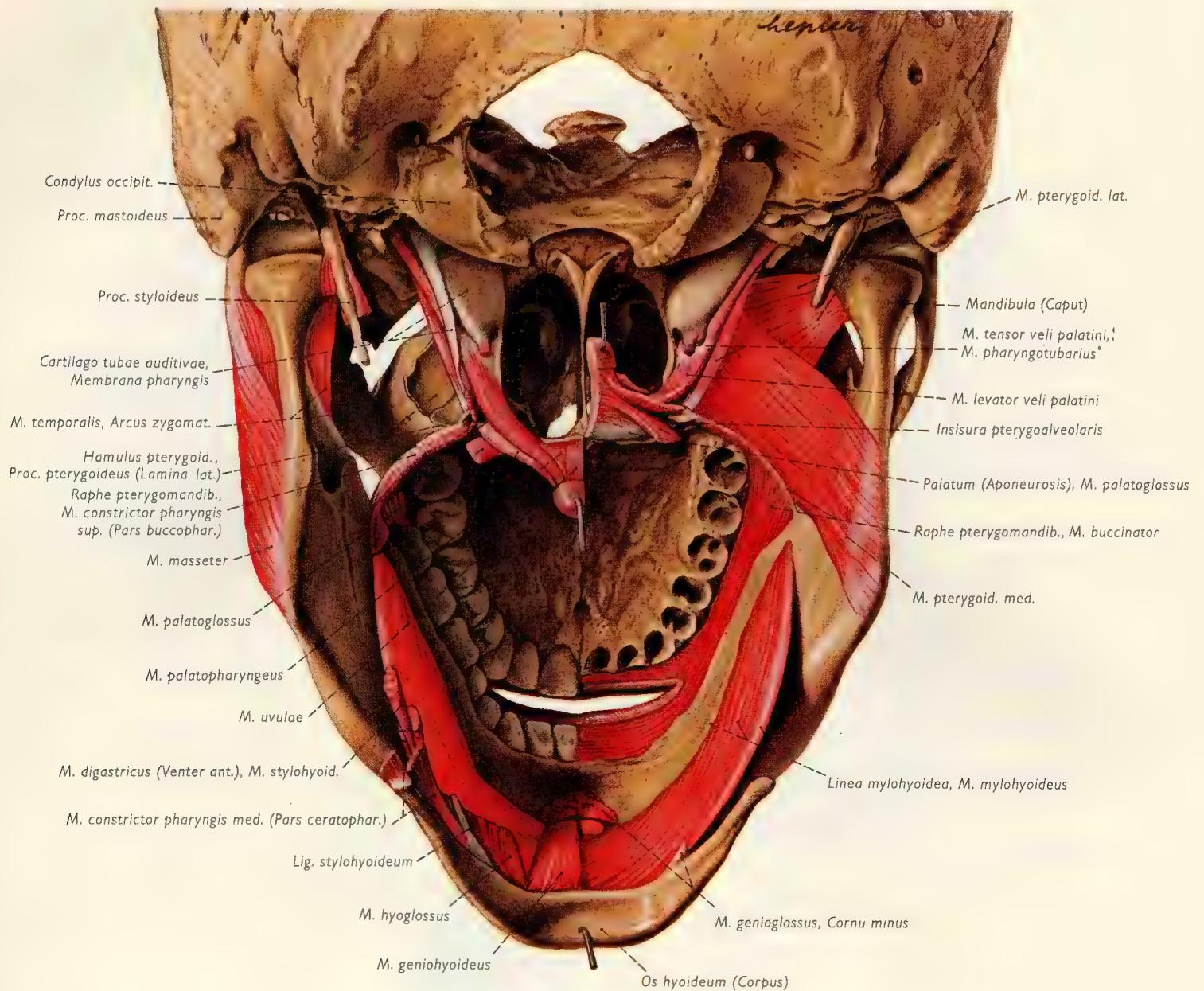


Fig. 158. Musculature and bony framework of the oral cavity seen from behind.

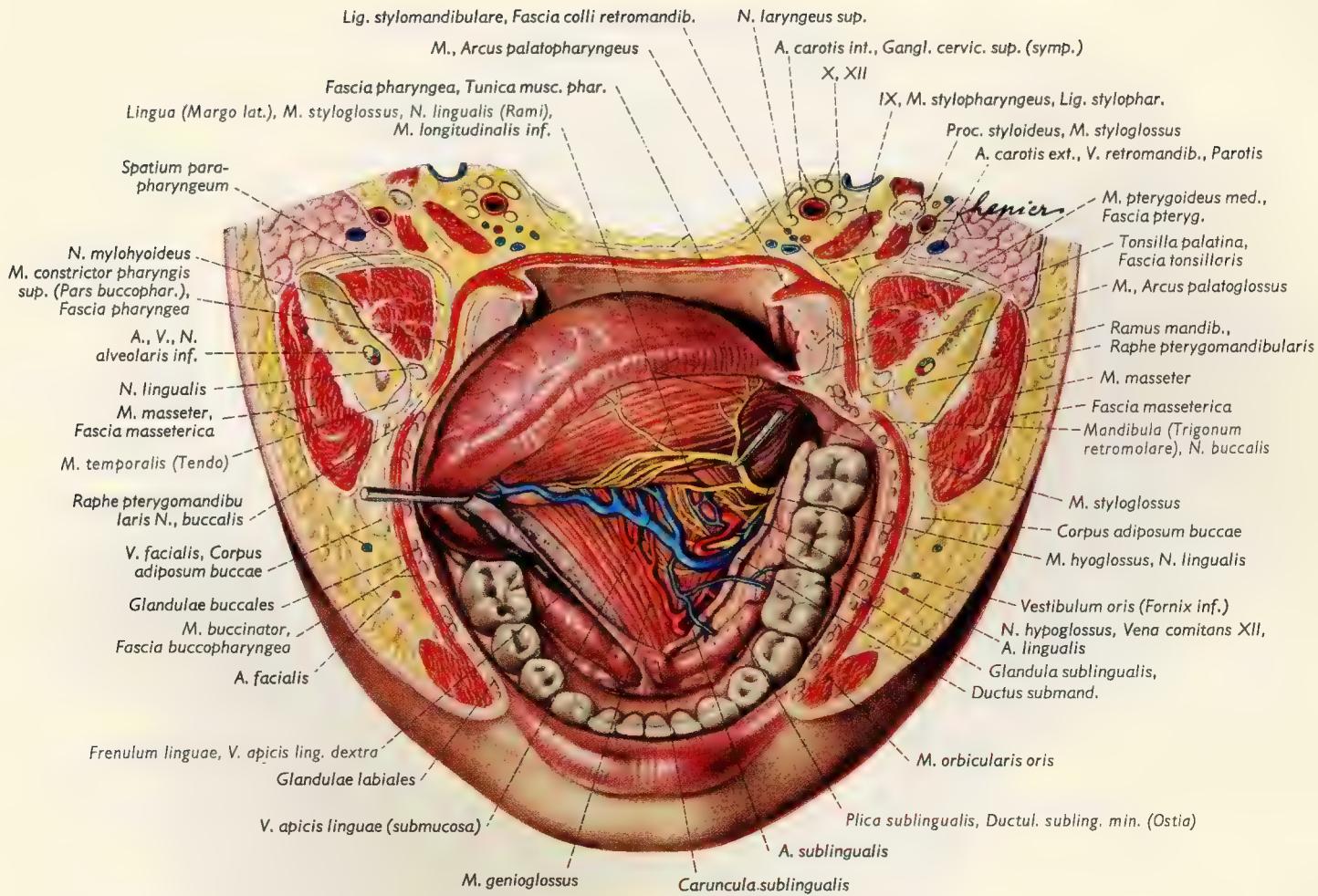


Fig. 159. Vessels and nerves in the floor of the oral cavity and the tongue on the left side. Cross section through the walls of the oral cavity and the pharynx at the level of the occlusal plane.

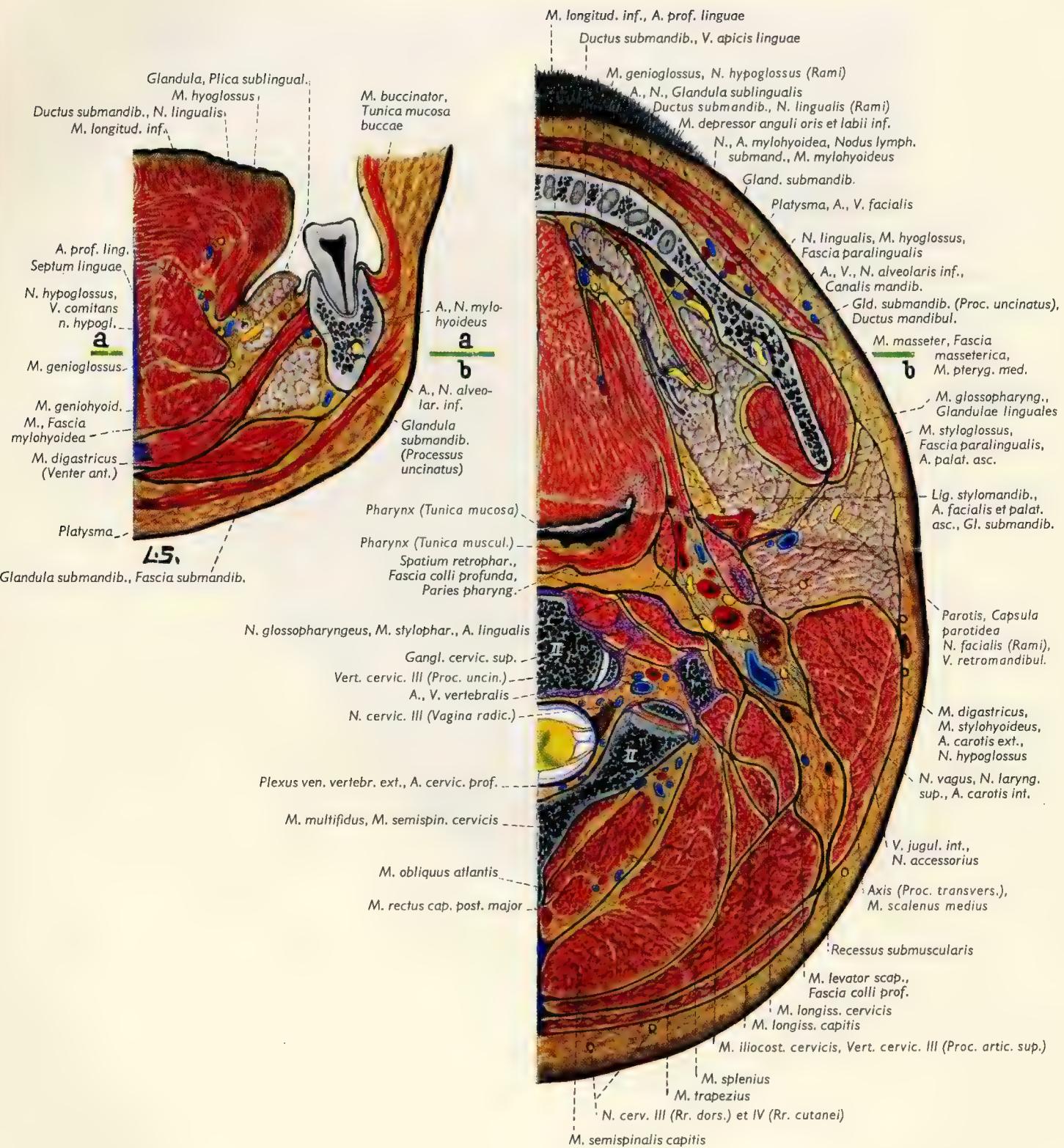


Fig. 160. (Top, left) Frontal section through the lingual, sublingual, and submandibular regions.
See Fig. 161 for explanation of the green lines.

Fig. 161. Transverse section through the submandibular and retromandibular regions on the right side. The large salivary glands are shown in cross section. The green lines (a-a, b-b) identify the levels of the frontal section in Fig. 160 and transverse section above.

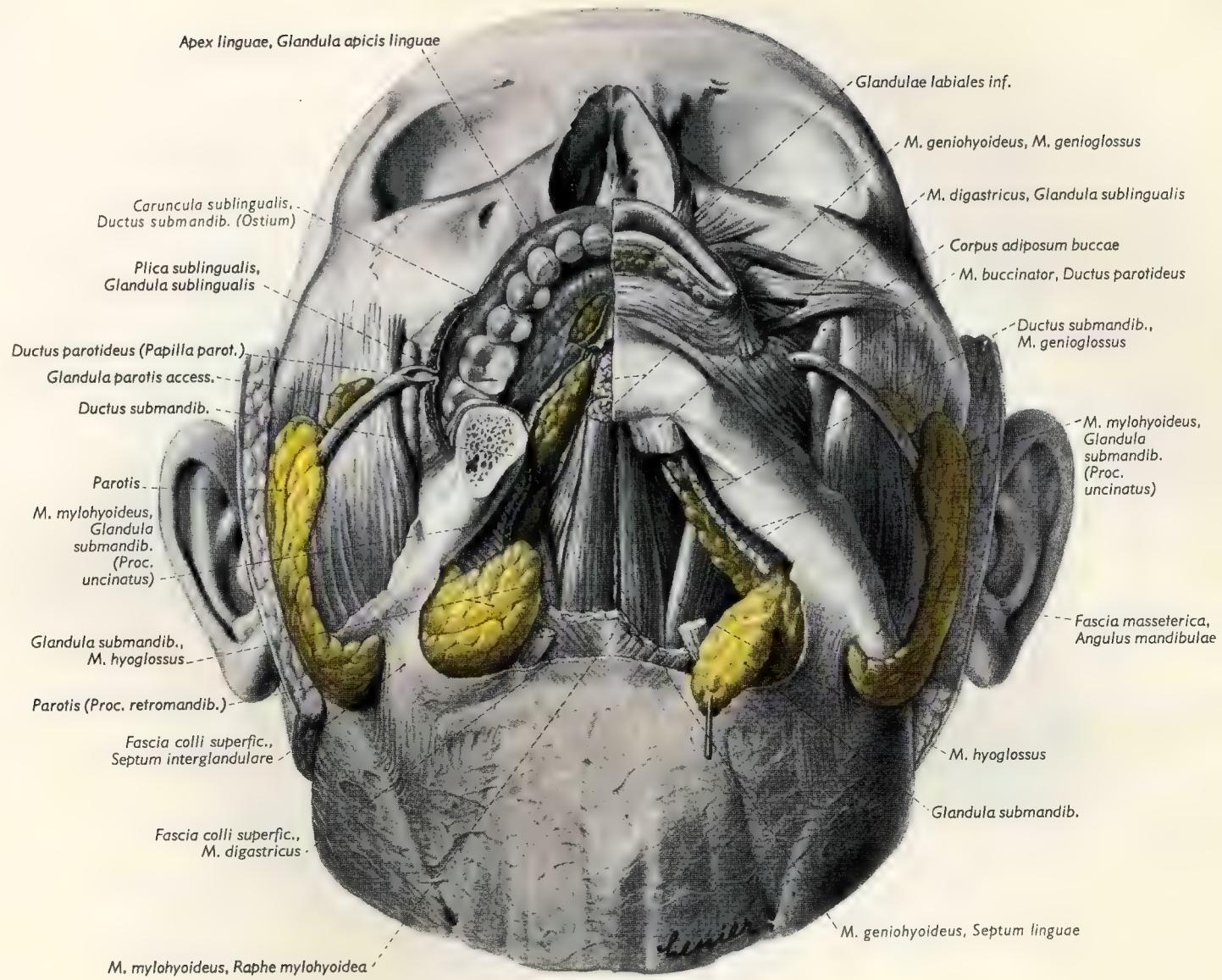


Fig. 162. The large salivary glands seen from front and below. The submandibular fascia and the capsule of the parotid with the masseteric fascia have been removed; the anterior belly of the digastric has been resected; but the "angular tract," an extension of the superficial layer of the cervical fascia, is retained in front of the angle of the mandible.

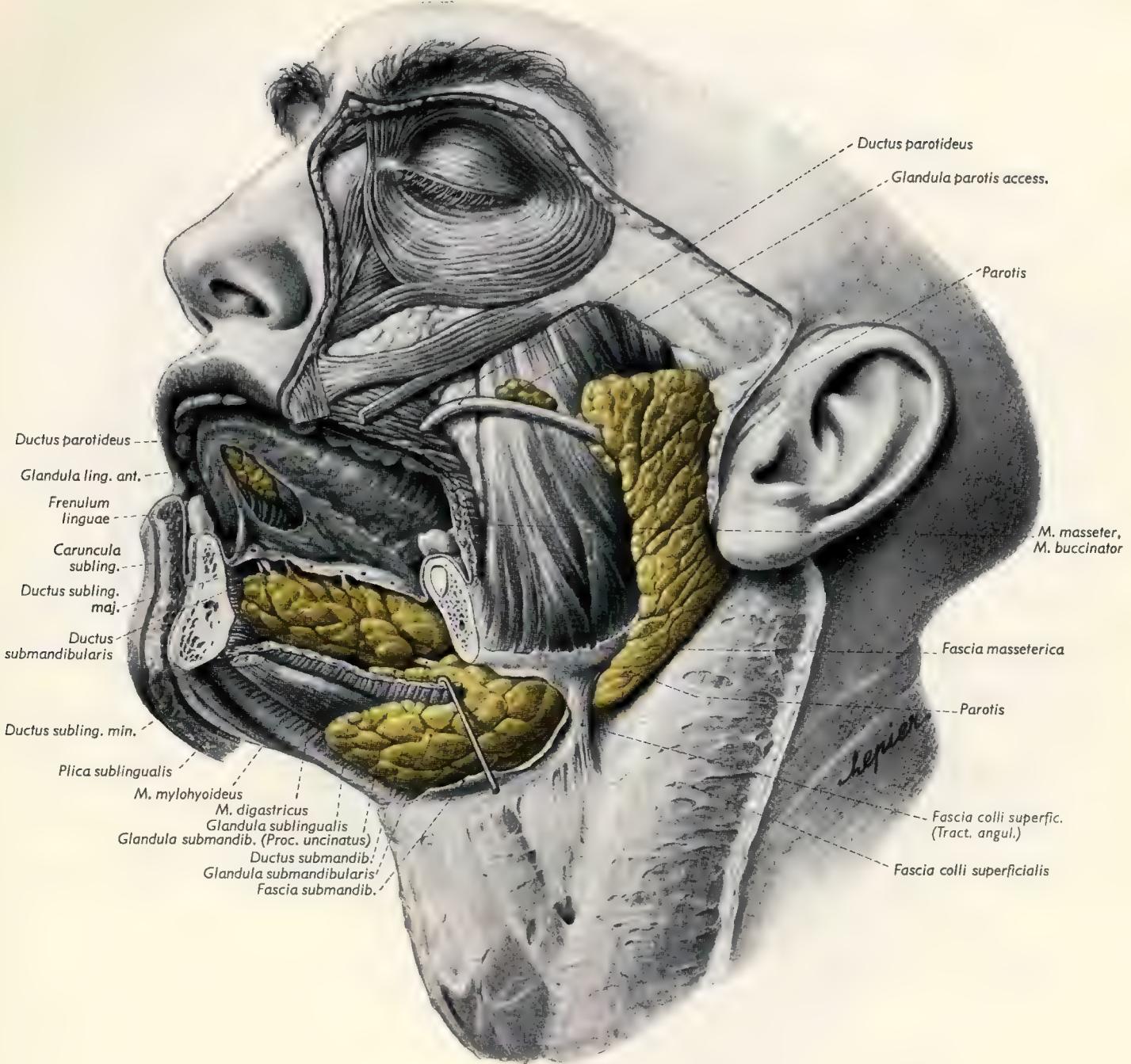


Fig. 163. Lateral view of the large salivary glands and their ducts. The body of the left half of the mandible has been removed.

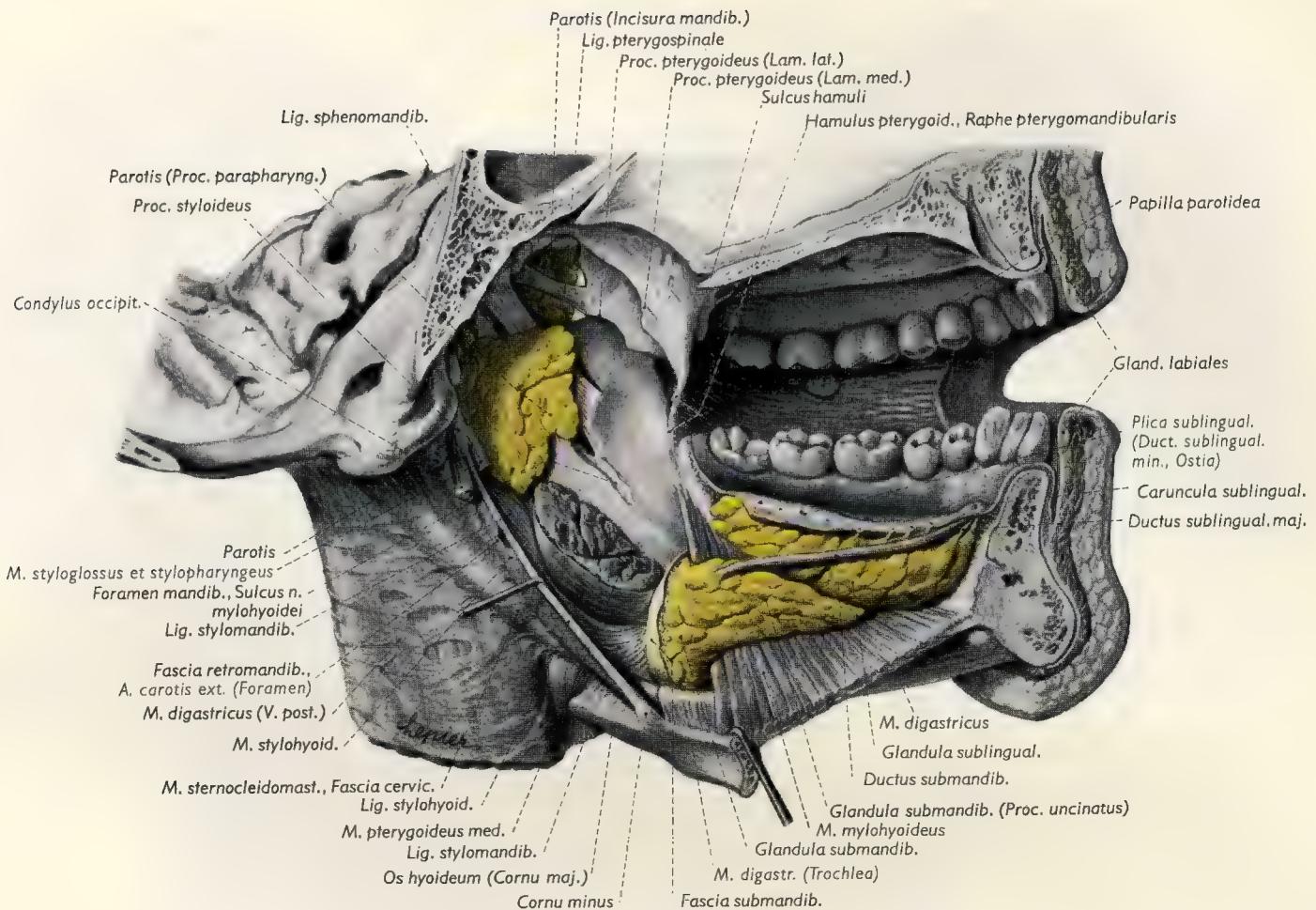
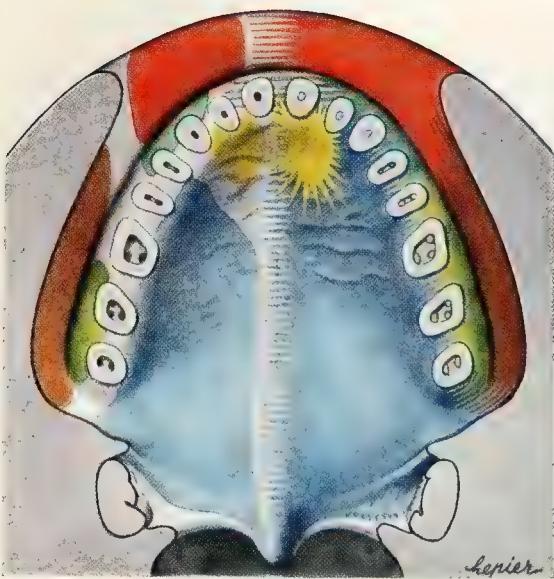
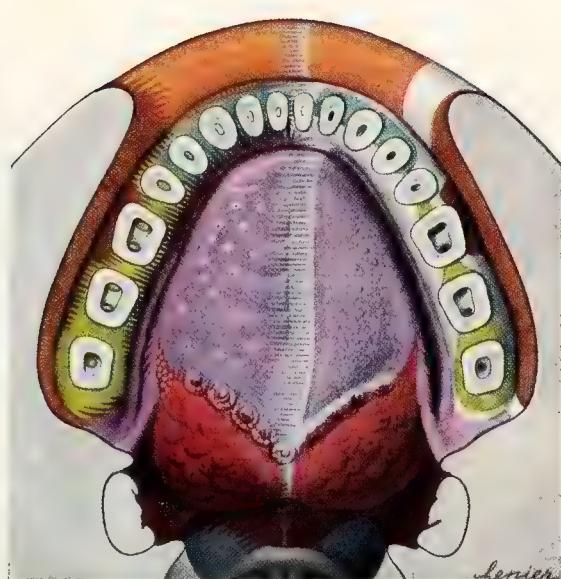


Fig. 164. Medial view of the salivary glands on the left side. The drawing shows the openings of the ducts of the salivary glands, the reationship of the submandibular gland with uncinate process hooking around the posterior border of the mylohyoid muscle, the course and relationship of the submandibular duct to the sublingual gland, and the parapharyngeal process of the parotid which projects forward from the retromandibular fossa between the sphenomandibular and stylomandibular ligaments medial to the medial pterygoid muscle into the parapharyngeal space.



The field of the {

■ Nn. alveol. sup. post.	■ N. infraorbit. (d. Rr. lab. sup.)
■ Nn. alveol. sup. ant.	■ Nn. palatini
■ N. buccalis	■ N. nasopalatinus

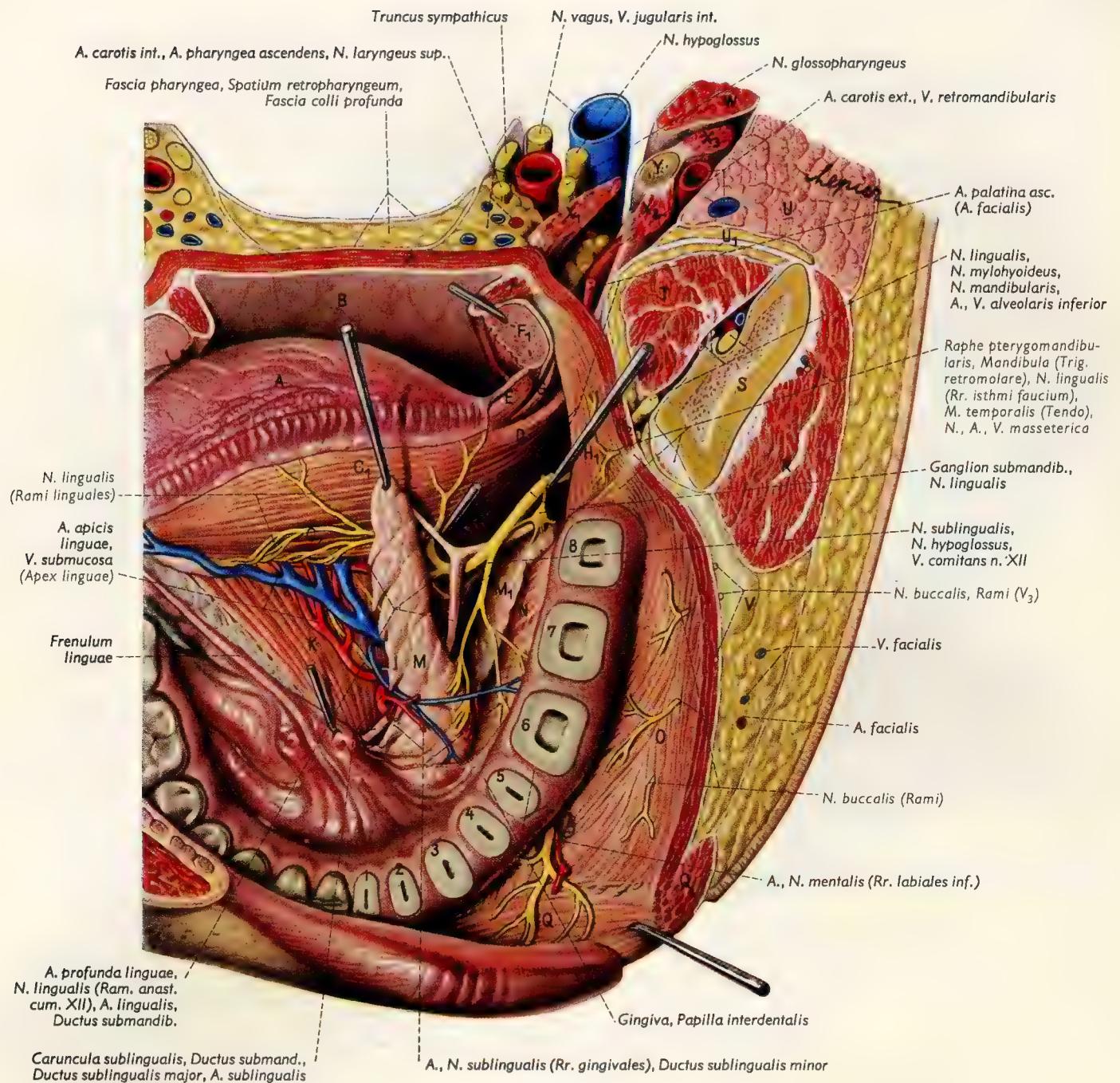


The field of the {

■ N. alveol. inf. (Rr. ant.)	■ N. mentalis (Rr. lab. inf.)
■ N. alveol. inf. (Rr. post.)	■ N. lingualis
■ N. buccalis	■ N. glossopharyng.

Fig. 165. (Top, left) Sensory fields of mucosal innervation in the roof of the oral cavity (vestibule and oral cavity proper) in the regions of the cheeks, upper lip, gingiva, teeth of upper jaw, and palate. The teeth have been cut transversely through the necks and the pulp cavities are opened so that the relationships of the maxillary dental nerves may be established. Specific areas of innervation by individual nerves are shown on the right side, and maximal areas of distribution and the overlapping fields of innervation are illustrated on the left side in different colors (modified from Scharlau, *Ergebnisse der Zahnheilkunde*, 1929).

Fig. 166. (Top, right) Sensory fields of mucosal innervation in the floor of the oral cavity (vestibule and oral cavity proper) in the regions of the cheeks, lower lip, gingiva, teeth of lower jaw, and tongue. The teeth have been cut transversely through the necks and the pulp cavities are opened so that the relationships of the mandibular dental nerves may also be established. Specific areas of innervation by individual nerves are shown on the right side, and maximal areas of distribution and the overlapping fields of innervation are illustrated on the left side in different colors (modified from Scharlau, *Ergebnisse der Zahnheilkunde*, 1929). On the left side, the sensory taste areas innervated by *n. intermedius* (chorda tympani) are indicated by white rings; sensory taste areas innervated by the glossopharyngeal nerve are identified by white dots.



A = Dorsum linguae
 B = Pharynx, Paries posterior
 C₁ = M. longitudinalis sup.
 C₂ = M. longitudinalis inf.
 D = M. styloglossus
 E = M. palatoglossus
 F = M. palatopharyngeus
 F₁ = Tonsilla palatina
 G = Pars glossopharingea
 H₁ = Pars mylopharingea
 H₂ = Pars buccopharyngea

J = M. constrictor pharyngis sup.
 K = M. genioglossus
 L = M. hyoglossus
 M = Glandula sublingualis
 M₁ = Glandula submandibularis (Processus uncinatus)
 N = M. mylohyoideus
 O = M. buccinator
 P = M. depressor labii inf.
 Q = M. orbicularis oris
 R = M. masseter

S = Mandibula (Ramus)
 T = M. pterygoideus med.
 U = Parotis
 U₁ = Lig. stylomandib.
 V = Corpus adiposum buccae
 W = M. digastricus (Venter post.)
 X₁ = M. stylopharyngeus
 X₂ = M. styloglossus
 X₃ = M. stylohyoideus
 Y = Processus styloideus

Fig. 167. Cross section through the face at the level of the occlusal plane. The tongue is deviated to the right; the sublingual gland has been mobilized from its bed and elevated.

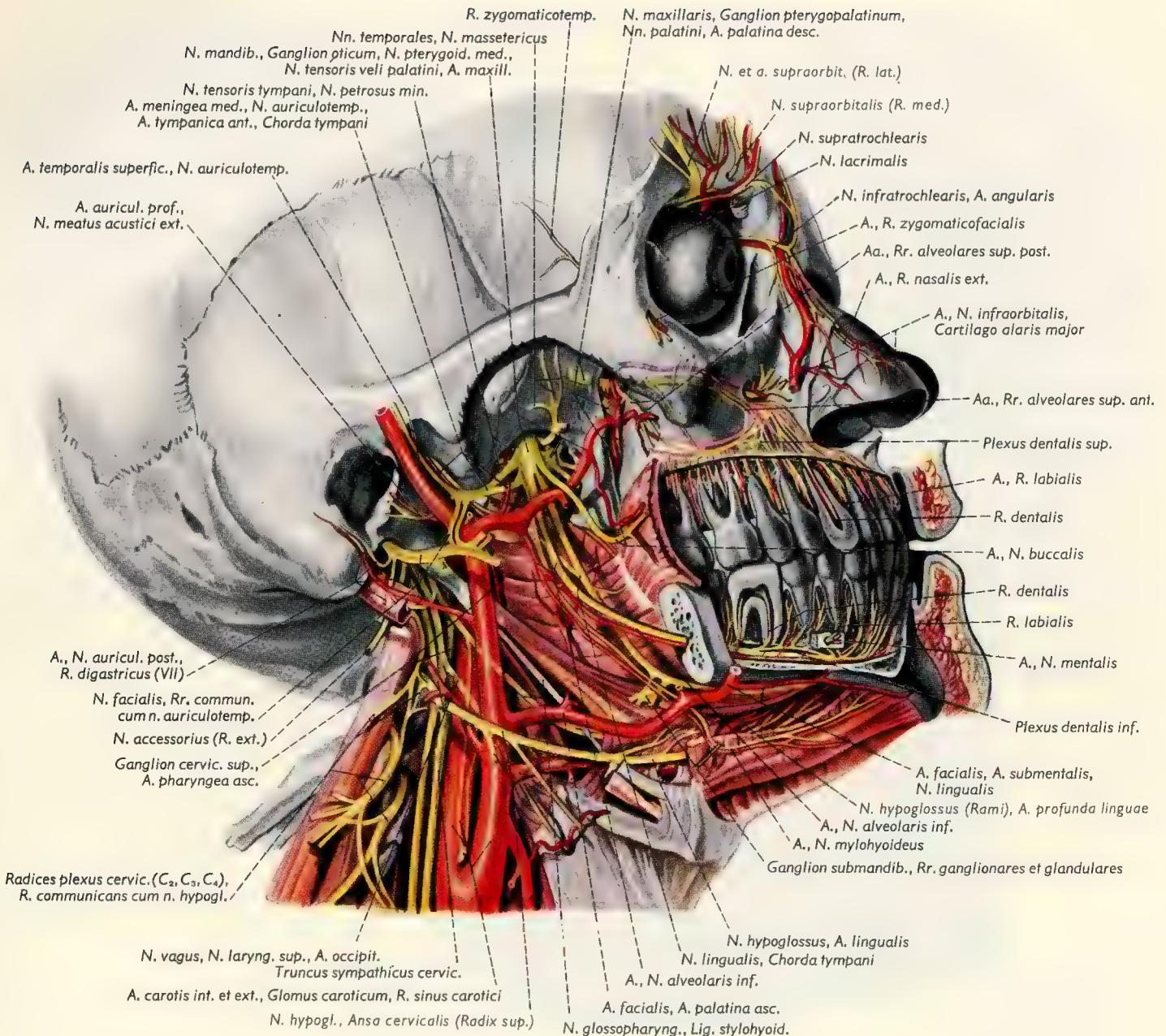
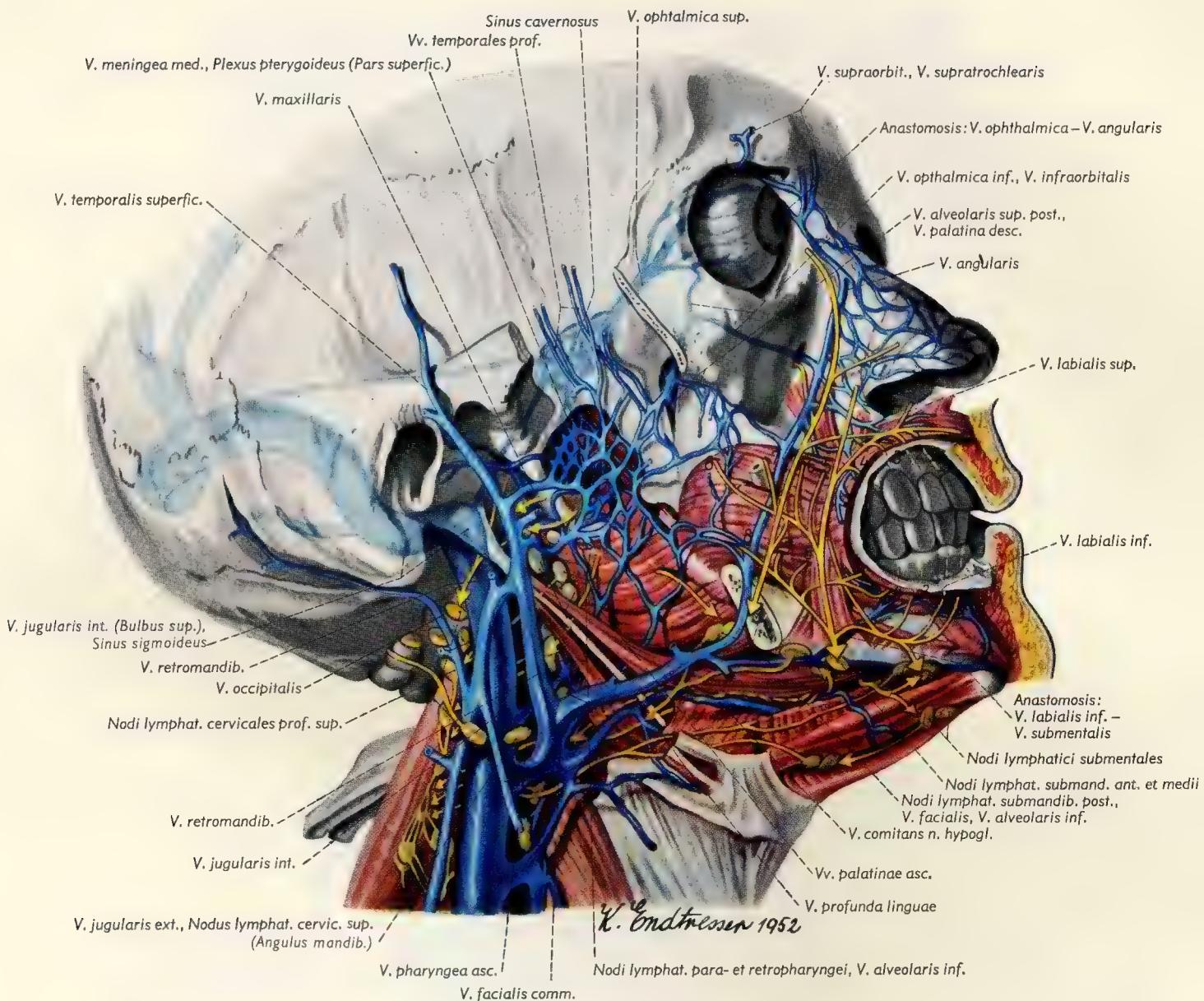
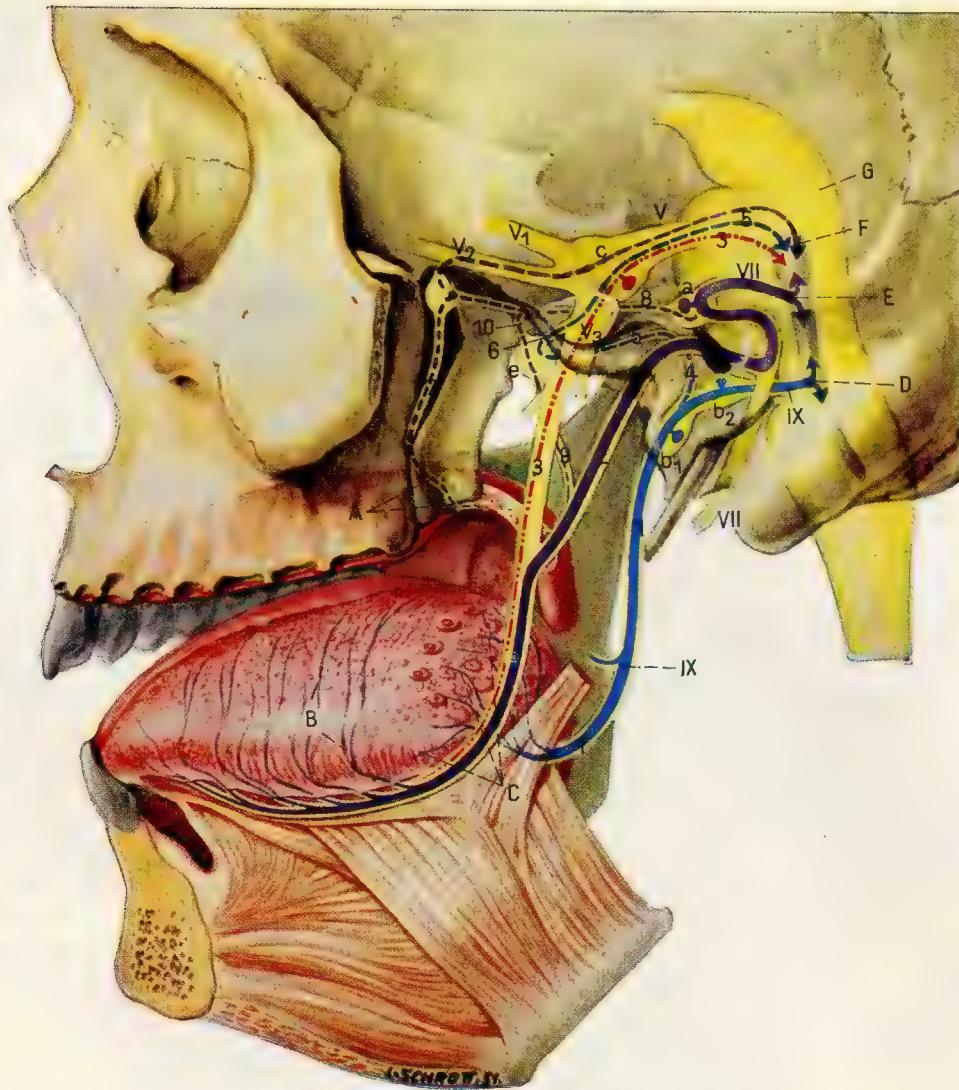


Fig. 168. Arteries and nerves of the jaws and the deep region of the face (seen from the right side). The ramus of the mandible has been removed with the deep muscles of mastication; the wall of the vestibule of the mouth was resected in order to expose the roots of the teeth.



1-8 = Lymph vessels from the teeth (alveoli) of upper and lower jaws

Fig. 169. Veins and lymphatics of the jaw and deep face region seen from right side. Lymph vessels are indicated schematically by plain yellow lines.

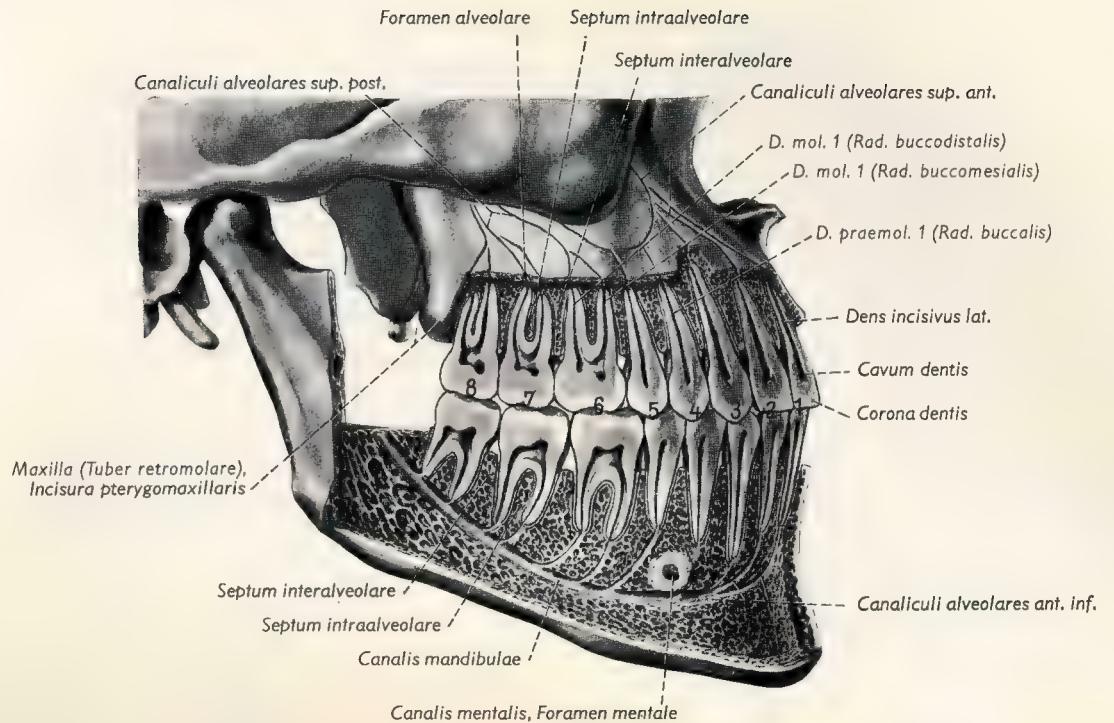


V = N. trigeminus
 V₁ = N. ophthalmicus
 V₂ = N. maxillaris
 V₃ = N. mandibularis
 VII = N. facialis-intermedius
 IX = N. glossopharyngeus
 1 = taste fibers in glossopharyngeal n.
 2 = taste fibers in chorda tympani
 of facial n.
 3 = taste fibers in lingual n. of
 trigeminal n.
 4 = N. tympanicus
 5 = N. petrosus minor
 6 = root of otic ganglion from
 mandibular n.

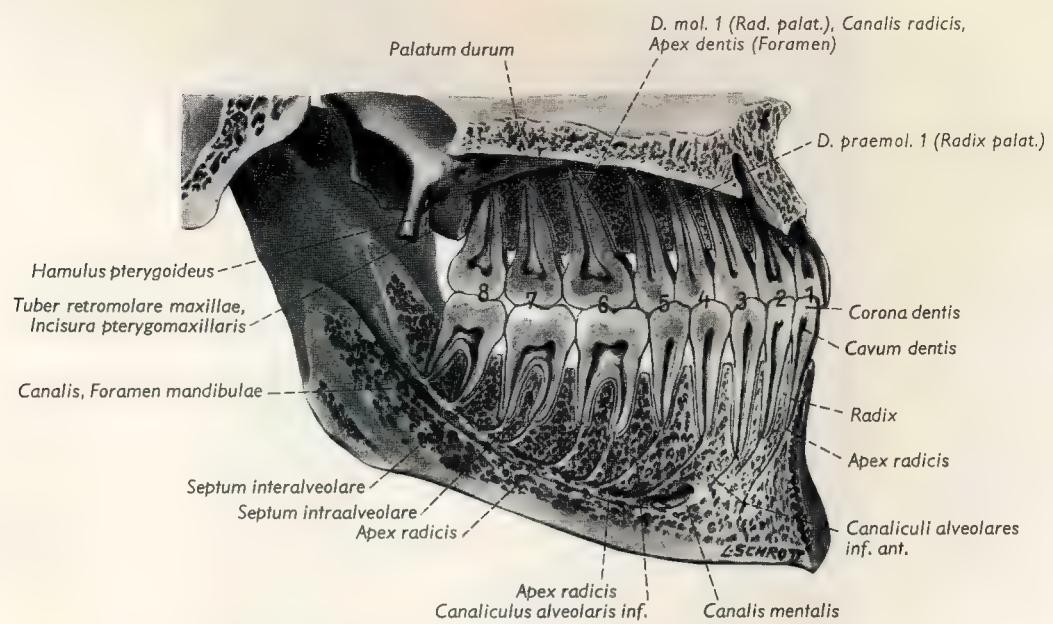
7 = Nn. palatini
 8 = N. petrosus major
 9 = R. anastomoticus chordae
 tympani with ganglion oticum
 10 = N. sphenopalatus med. (int.)
 a = geniculate ganglion of facial n.
 b₁ = inferior (petrosal) ganglion of
 glossopharyngeal n.
 b₂ = superior ganglion of
 glossopharyngeal n.
 c = semilunar ganglion of trigeminal n.
 d = Ganglion pterygopalatinum
 e = Ganglion oticum

A = terminal branches of palatine nn.
 B = terminal branches of lingual
 n. in ant. gust. field
 C = terminal branches of glosso-
 pharyngeal n. in post. gust. field
 D = glossoph. fibers entering
 solitary tract and nucl.
 (gust. nucl.)
 E = intermed. fibers entering solitary
 tract and nucl. (gust. nucl.)
 F = trigeminal fibers entering solitary
 tract and nucl. (gust. nucl.)
 G = brain stem

Fig. 170. The course of peripheral taste fibers within the branchial nerves (schematic representation of main and collateral pathways).

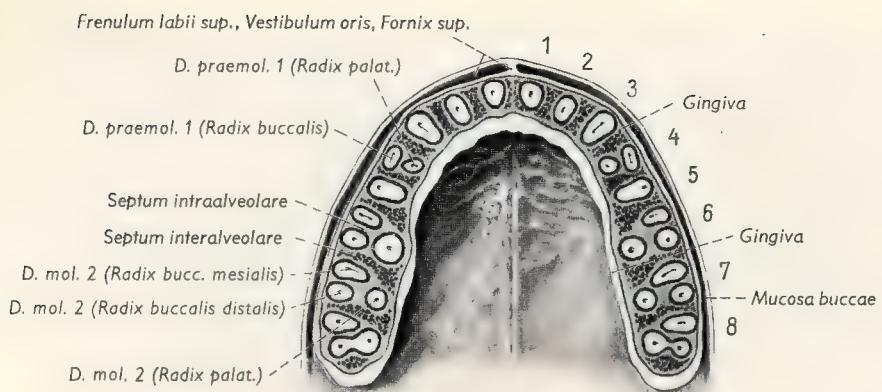


a) Illustration of the upper and lower sets of teeth (1–8), seen from the lateral (vestibular) side.

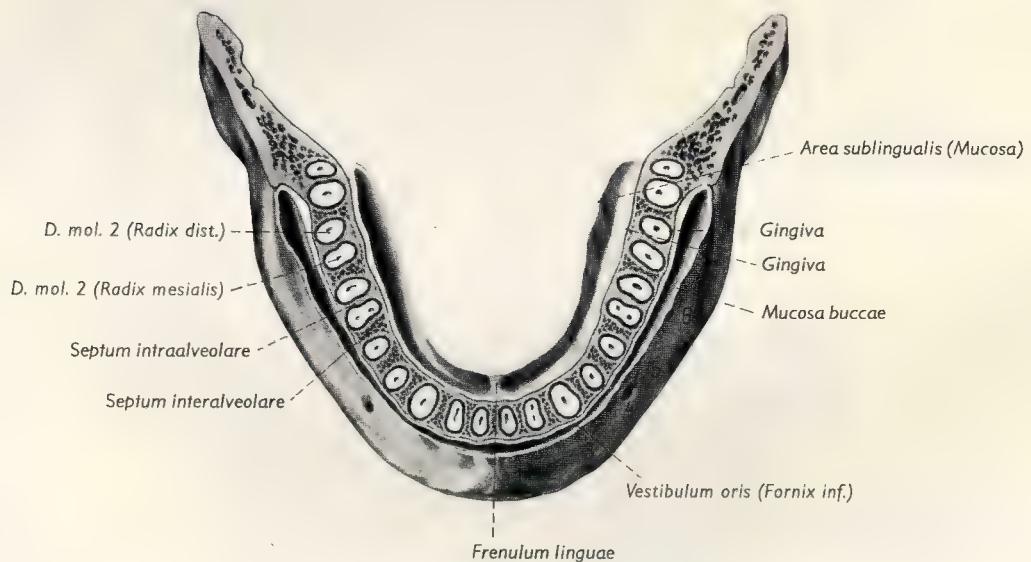


b) Illustration of the upper and lower sets of teeth (1–8), seen from the medial (oral) side.

Fig. 171. One half of the permanent set of teeth with exposure of the entire root structure (by chiseling off the corresponding parts of the alveolar processes in a macerated specimen). The individual tooth is sectioned in its long axis (axial); pulp cavity and root canal have been opened.



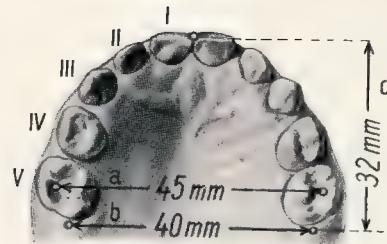
a) Roots of permanent teeth in upper jaw (1–8).



b) Roots of permanent teeth in lower jaw.

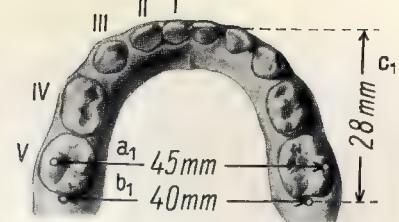
1 = central incisor	5 = 2nd premolar
2 = lateral incisor	6 = 1st molar
3 = canine tooth	7 = 2nd molar
4 = 1st premolar	8 = 3rd molar

Fig. 172. Transverse section through the alveolar processes showing the roots of the teeth (horizontal section through the upper and lower jaws).



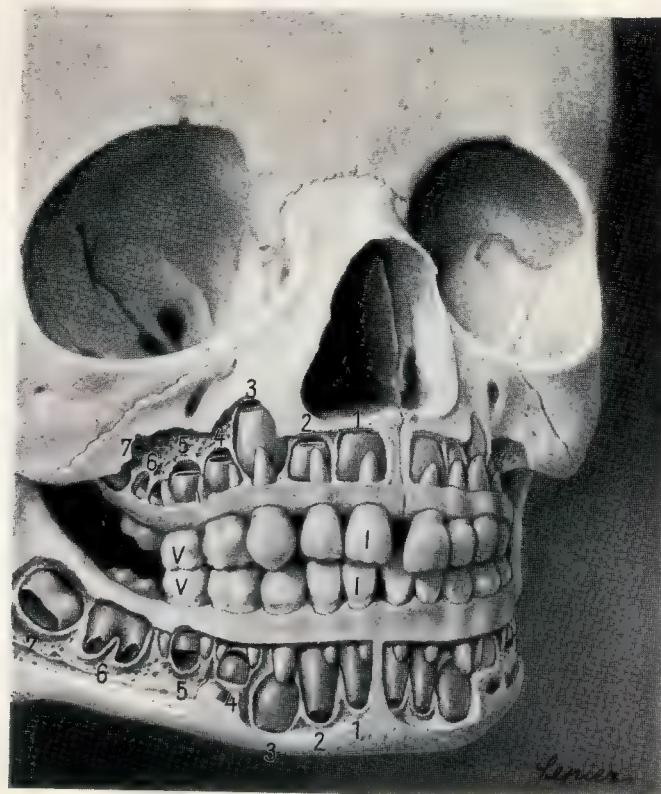
a) The row of teeth in the upper jaw of a child (the upper dental arch of deciduous teeth)

- a = Intermolar distance between the 2 upper 2nd deciduous molars (45 mm), measured from the centers of the crown surfaces
- b = Intertuberal distance measured behind the distal surfaces of the 2nd upper deciduous molars (40 mm)
- c = Longitudinal axis of upper dental arch measured from the medial edge of the medial (central) incisor to the middle of the intertuberal line (32 mm)



b) The row of teeth in the lower jaw of a child (the lower dental arch of deciduous teeth)

- a₁ = Intermolar distance between the 2 lower 2nd deciduous molars (45 mm), measured from the buccodistal cusps of the crown surfaces
- b₁ = Intertrigonal distance measured behind the distal surfaces of the lower 2nd deciduous molars (40 mm)
- c₁ = Longitudinal axis of lower dental arch measured from the medial edge of the central incisor middle of the intertrigonal line (28 mm)



I-V = Deciduous teeth of the maxilla and mandible
1-7 = Permanent teeth (anlagen)

Fig. 173. (Top) Deciduous teeth of a 4–5 year old child before eruption of the 1st permanent molar.

Fig. 174. (Bottom) Deciduous teeth and early permanent teeth in a 6 year old child. The roots of the deciduous teeth as well as those of the developing permanent teeth (anlagen) have been exposed in both upper and lower jaws.

Fig. 175

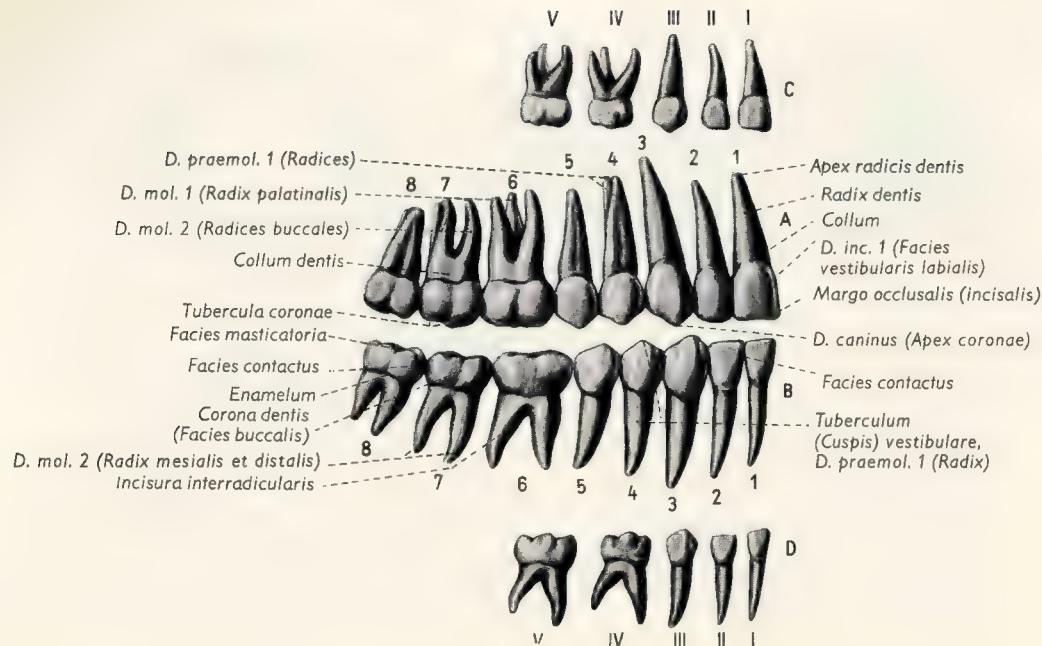
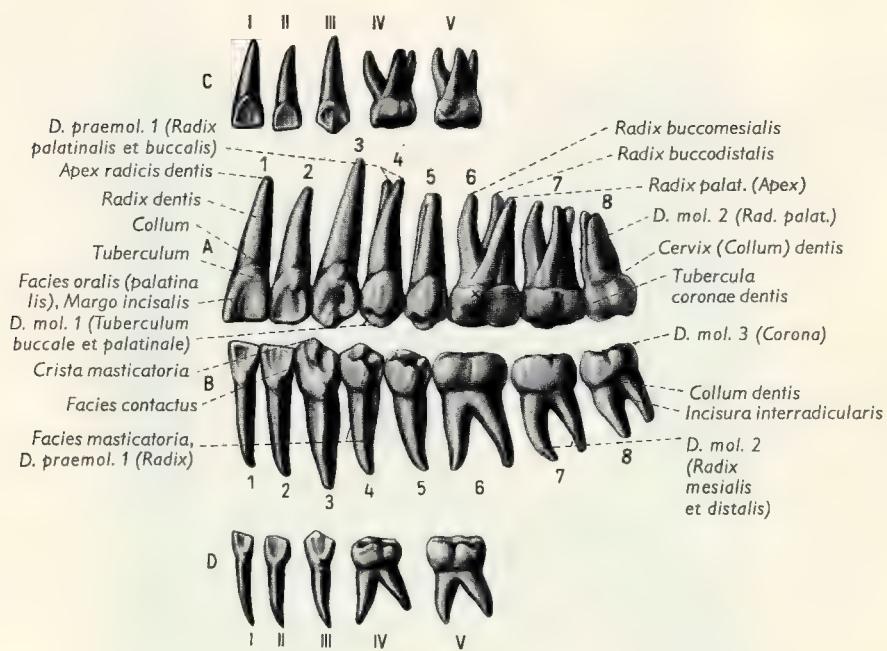


Fig. 176



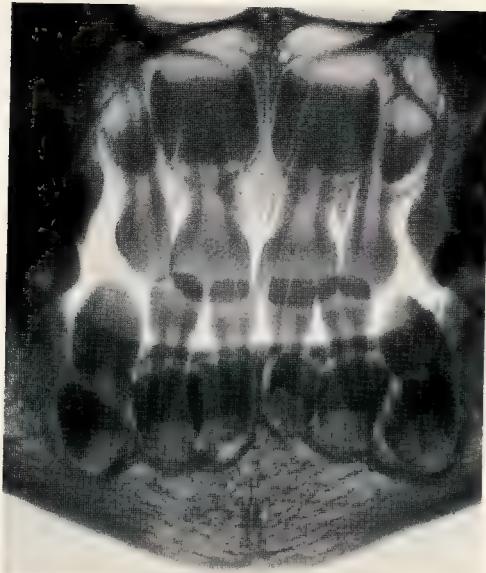
- A = The row of permanent teeth of the upper jaw
- B = The row of permanent teeth of the lower jaw
- C = The row of deciduous teeth of the upper jaw
- D = The row of deciduous teeth of the lower jaw

- Permanent teeth:
- 1 = Medial incisor
- 2 = Lateral incisor
- 3 = Canine
- 4 = 1st premolar
- 5 = 2nd premolar
- 6 = 1st molar
- 7 = 2nd molar
- 8 = 3rd molar
- x = Carabelli tubercle

- Deciduous teeth:
- I = Medial incisor
- II = Lateral incisor
- III = Canine
- IV = 1st premolar
- V = 2nd premolar

Fig. 175. Deciduous and permanent teeth of the right side (seen from the vestibular side).

Fig. 176. Deciduous and permanent teeth of the right side (seen from the oral side).



The four incisors



The two incisors and the canine tooth of right side



The canine tooth and the two premolars of right side



The two premolars and the three molars of right side



The four incisors



Lower incisors, canine tooth, and premolars



Premolars, first and second molars



The three molars

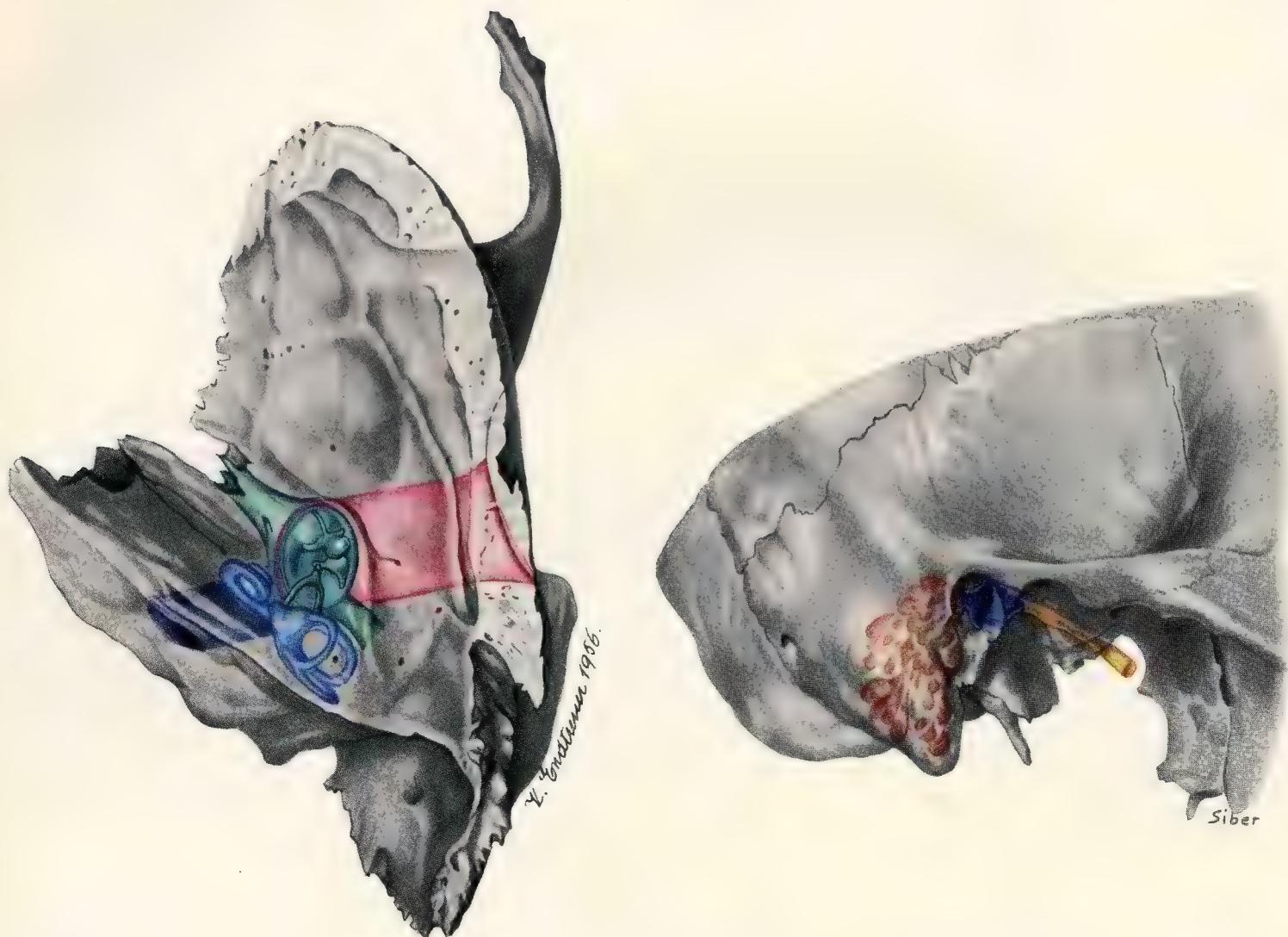
Fig. 177. (Top, left) Roentgenogram of the incisors and canines of the upper and lower jaws in a 2 1/2 year old child. The developing permanent teeth may be seen in the jaw (from W. Meyer, in: *Die Zahn-, Mund- und Kieferheilkunde*, Vol. II, Munich-Berlin, 1955).

Fig. 178. (Top, right) Roentgenograms of the deciduous molars and the developing 1st permanent molar in a 2 1/2 year old child (from W. Meyer, in: *Die Zahn-, Mund- und Kieferheilkunde*, Vol. II, Munich-Berlin, 1955).

Fig. 179. (Middle) Roentgenograms of permanent teeth. Teeth of upper jaw shown in 4 partial exposures (from W. Meyer, in: *Die Zahn-, Mund- und Kieferheilkunde*, Vol. II, Munich-Berlin, 1955).

Fig. 180. (Bottom) Roentgenograms of permanent teeth. Teeth of lower jaw shown in 4 partial exposures (from W. Meyer, in: *Die Zahn-, Mund- und Kieferheilkunde*, Vol. II, Munich-Berlin, 1955).

The Auditory and Vestibular Apparatus



Red = Meatus acusticus ext.
Green = Cavum tympani, Ossicula auditus
Blue = Auris interna

Fig. 181. (Left) The bony framework of the 3 subdivisions of the ear, depicted as translucent.

Fig. 182. (Right) Projection of the tympanic cavity (blue), the mastoid air cells (red), and the auditory tube (yellow) on the lateral surface of the skull.

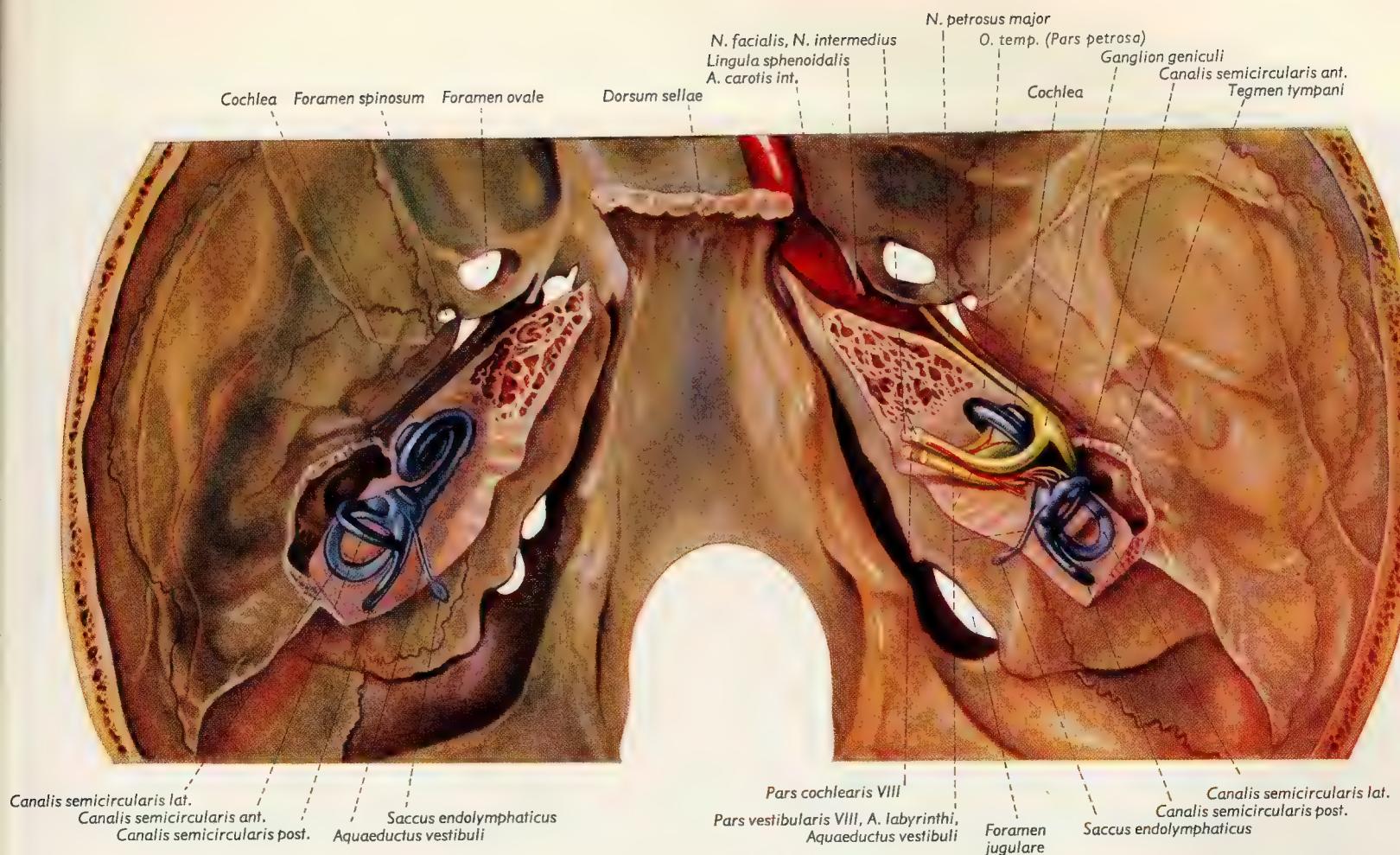


Fig. 183. The bony labyrinth, the vestibulocochlear nerve, and the facial nerve in situ in the petrosal bone. Metal cast of the labyrinth. The top of the pyramid has been chiseled out on both sides.

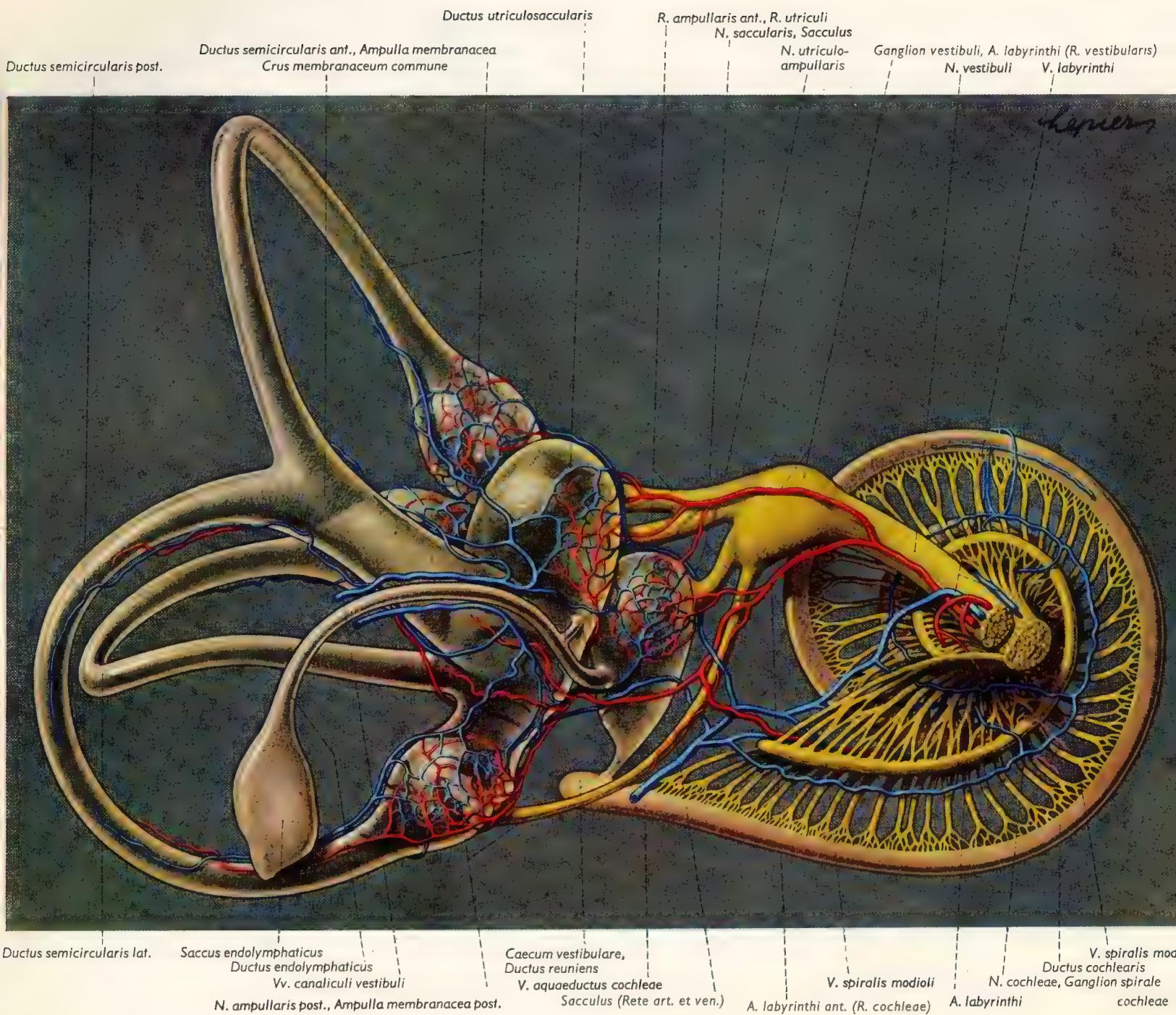


Fig. 184. Schematic representation of the left membranous labyrinth with vessels and nerves. Posteromedial view.

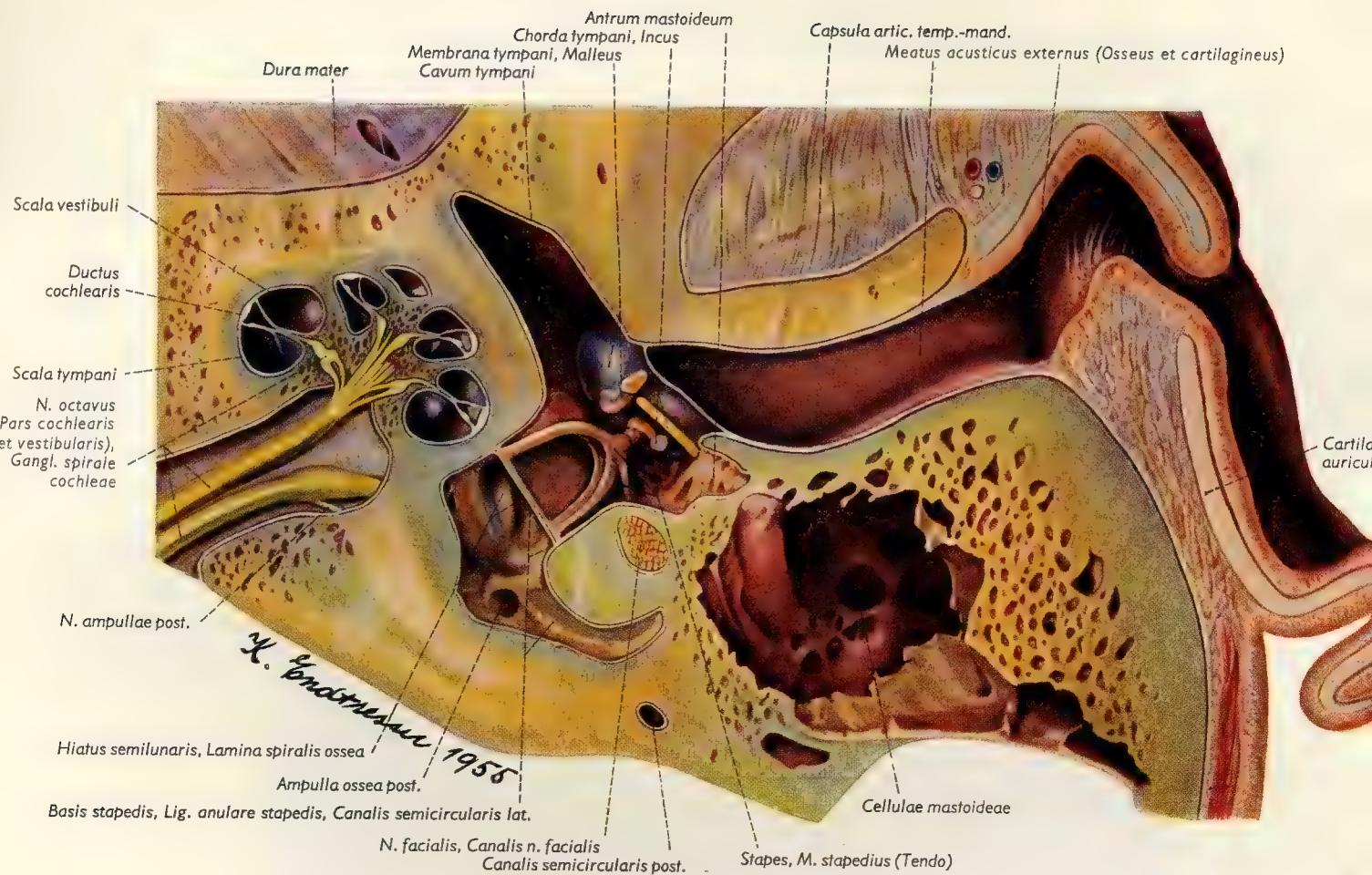


Fig. 185. Horizontal section through the ear at the level of the vestibular (oval) window. The cochlea has been cut axially; the floor of the vestibule and the lateral semicircular canal are illustrated. The stapes is intact, but the incus and malleus have been partly removed.

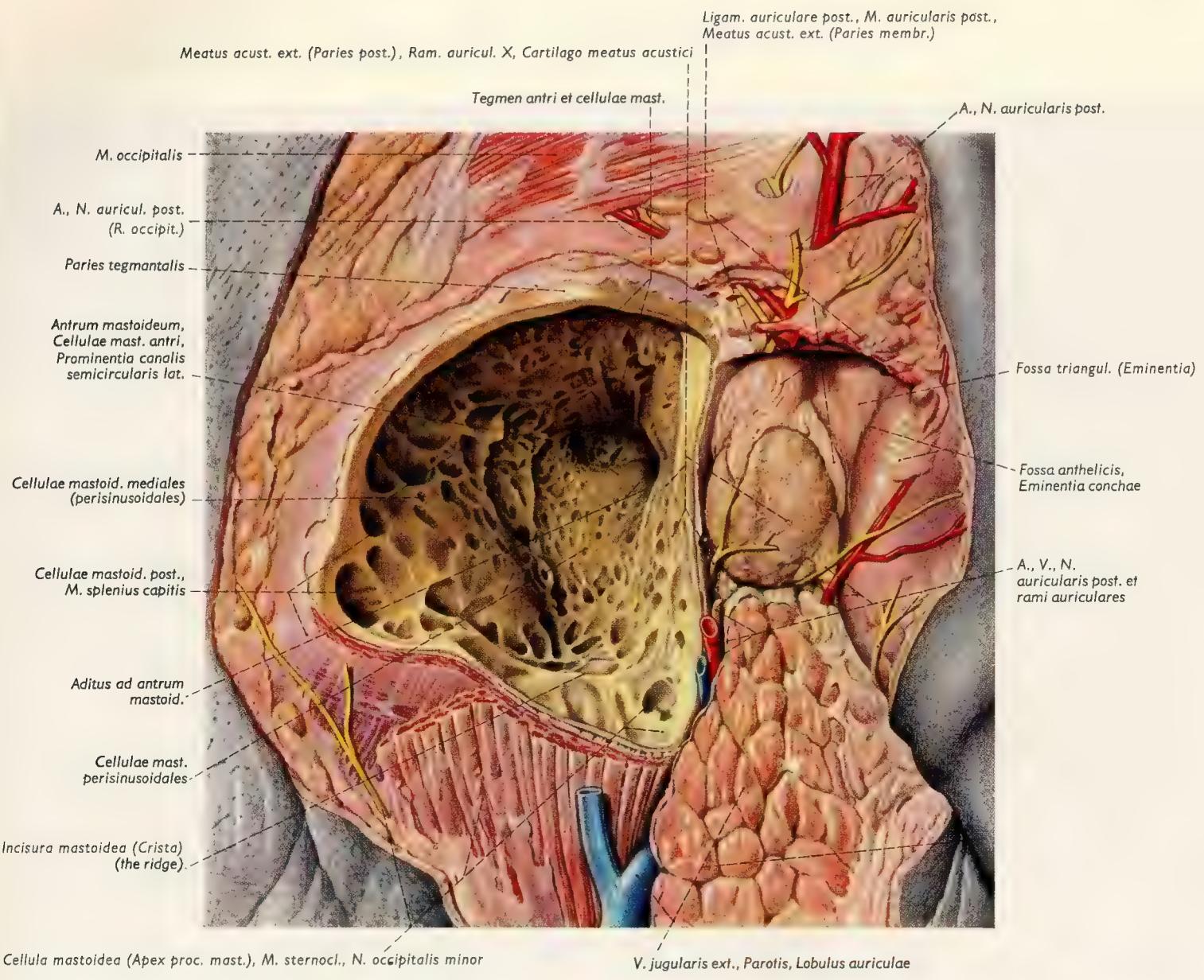


Fig. 186. Preparation of the mastoid air cells and antrum. The mastoid cells have been opened and partly removed, and the auricle has been reflected forward. The lateral wall of the mastoid cells was removed in such a way that no damage was done to the posterior bony wall of the external acoustic meatus. The tegmental wall (roof) was barely touched. The attachments of the sternocleidomastoid and splenius capititis muscles have been resected.

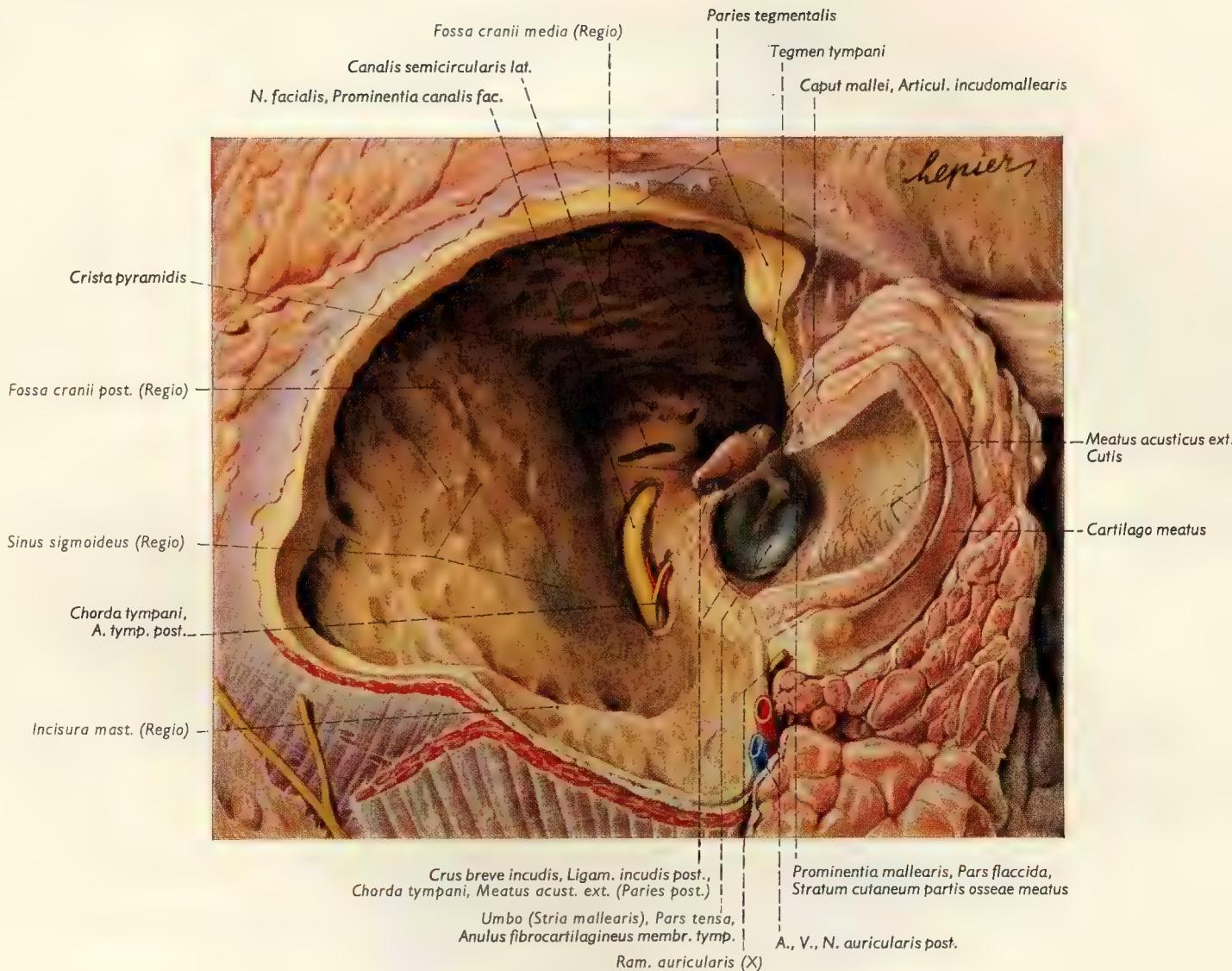


Fig. 187. Exposure of the outer components of the right ear through the mastoid region. The posterior wall of the external acoustic meatus was removed, and the descending part of the facial canal was opened. The mastoid cells were reamed out, and the lateral semicircular canal was opened.

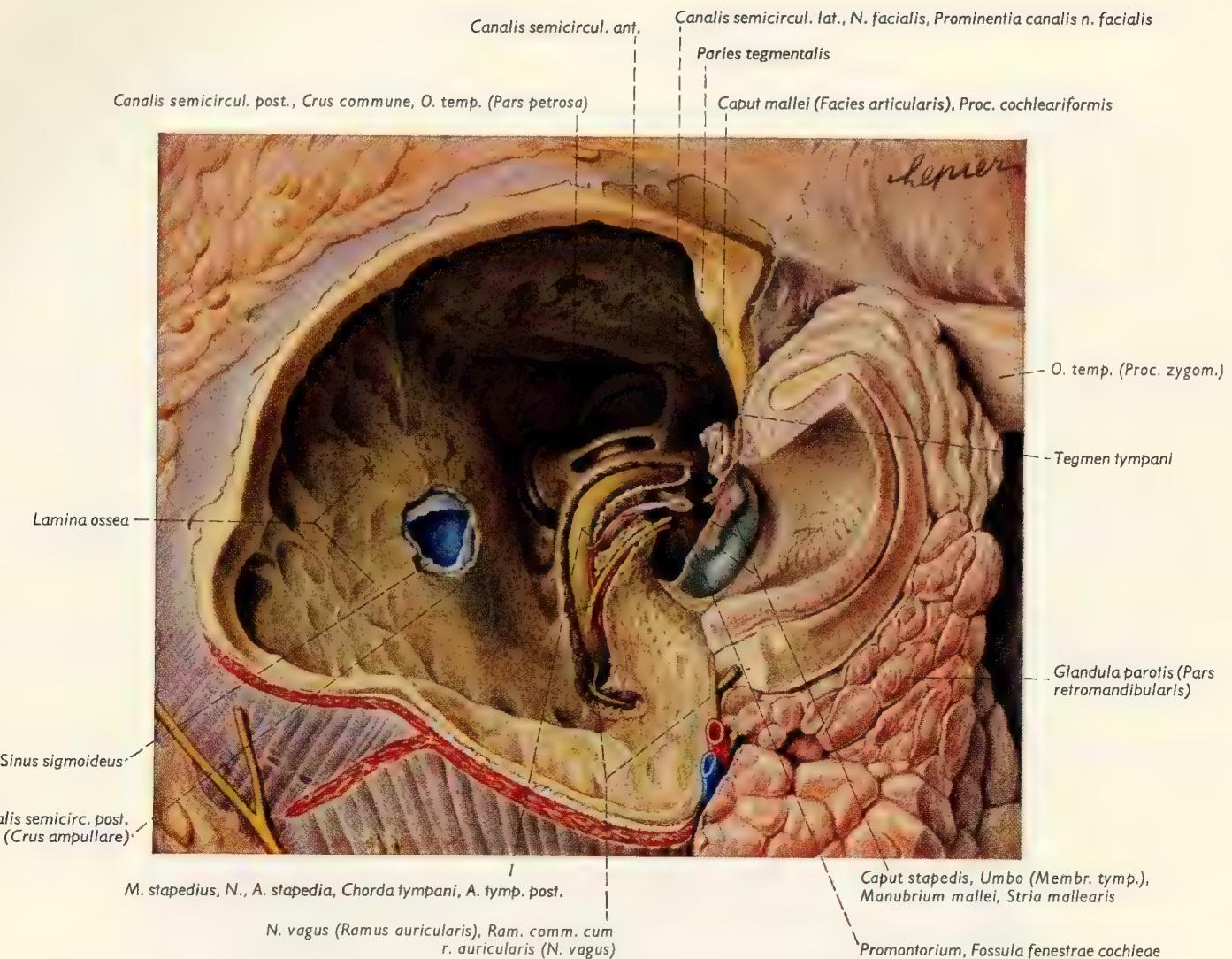


Fig. 188. Exposure of the right outer, middle, and inner ear through the mastoid region. The tympanic cavity with the stapes is opened; almost complete removal of the mastoid cells from the antrum. The sigmoid sinus is opened.

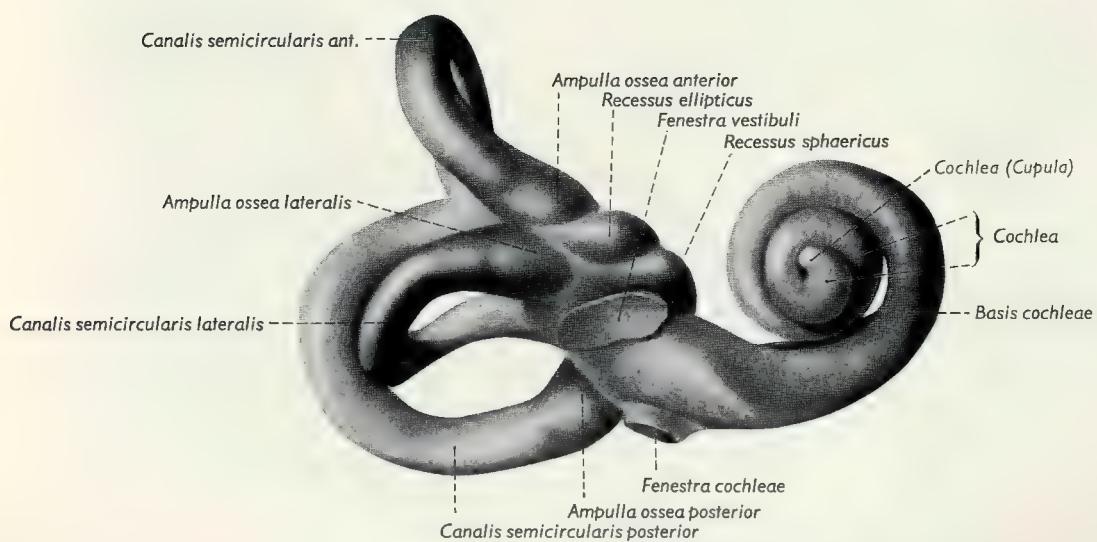
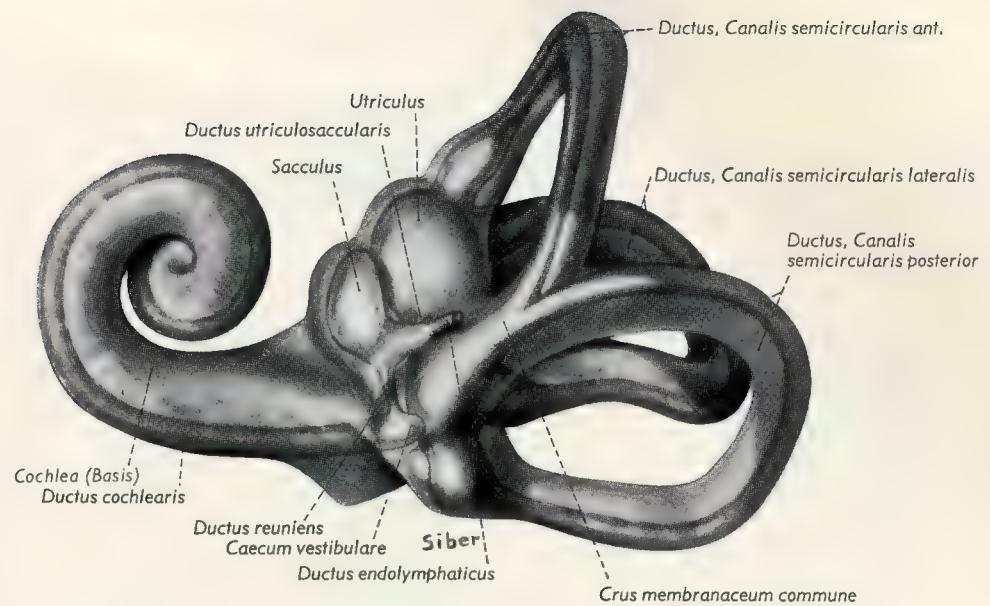


Fig. 189. (Top) Cast of the right bony labyrinth (the perilymphatic space) in a posteromedial view. The membranous labyrinth (the endolymphatic space) is illustrated as transparent.

Fig. 190. (Bottom) Cast of the right bony labyrinth in an anterolateral view.

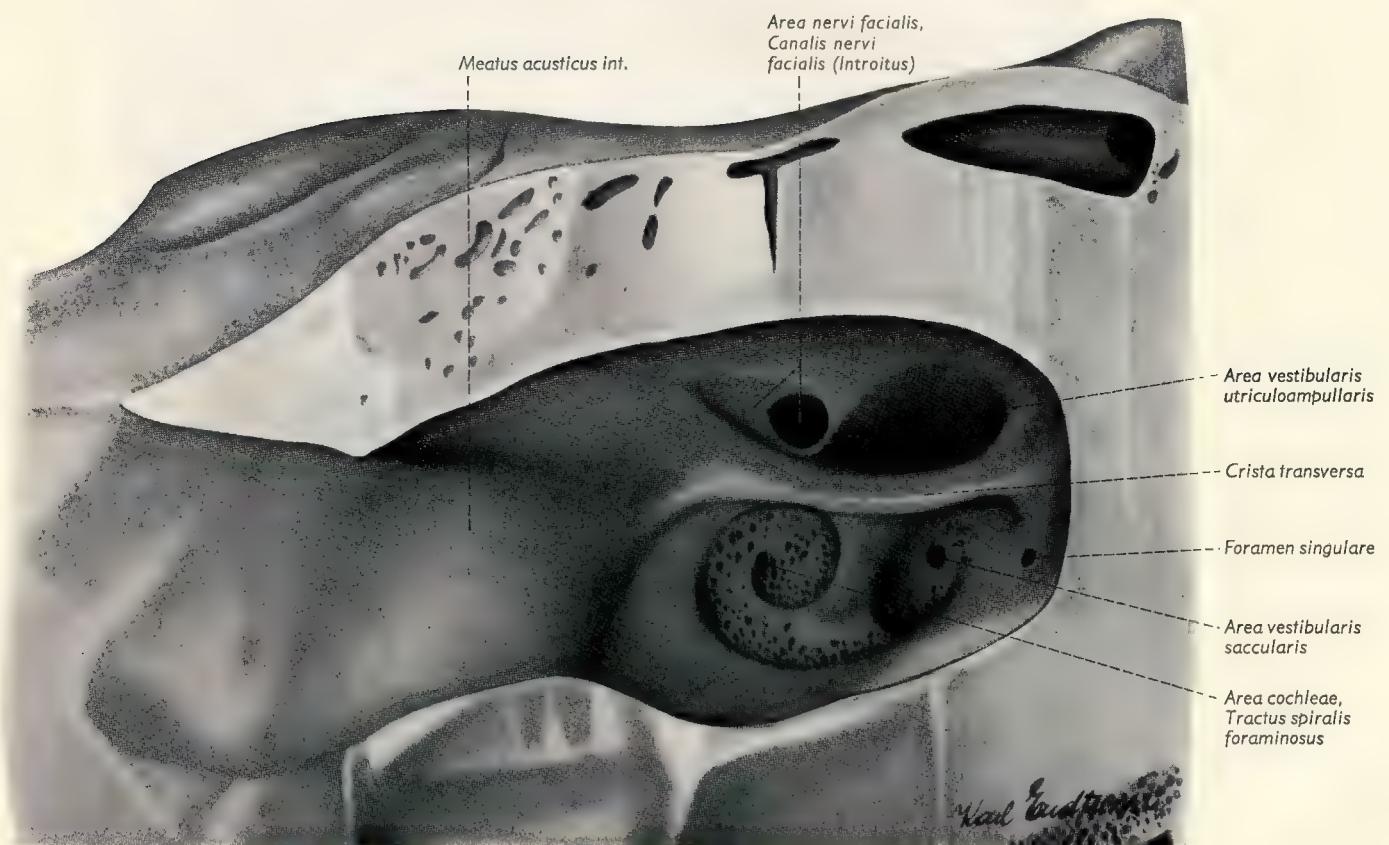
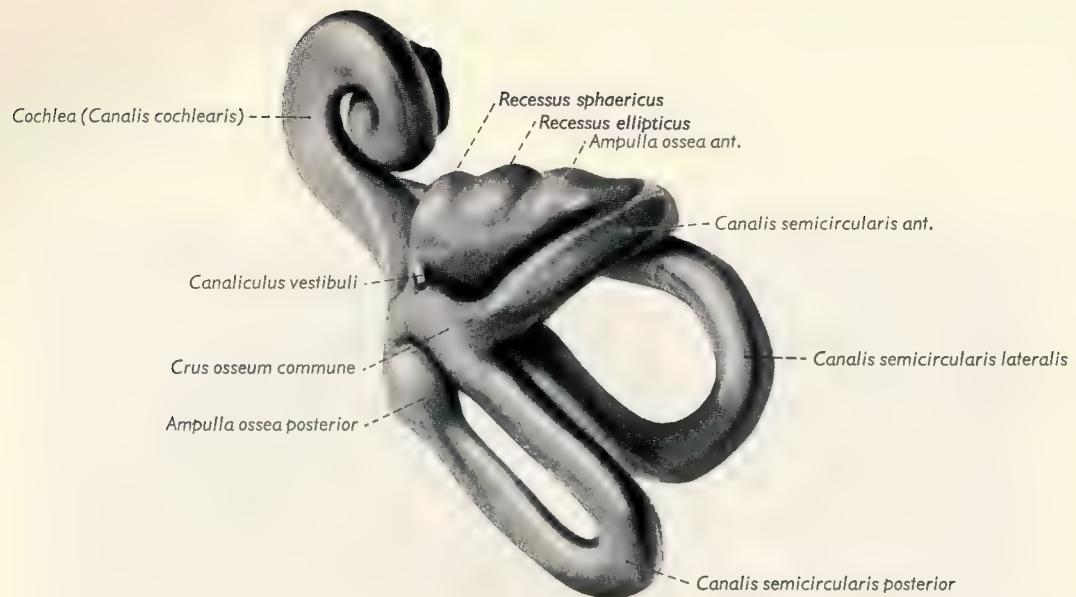


Fig. 191. (Top) Cast of right bony labyrinth seen from above.

Fig. 192. (Bottom) The fundus of the internal acoustic meatus on the right side. The internal acoustic meatus of a petrosal bone has been opened from behind.

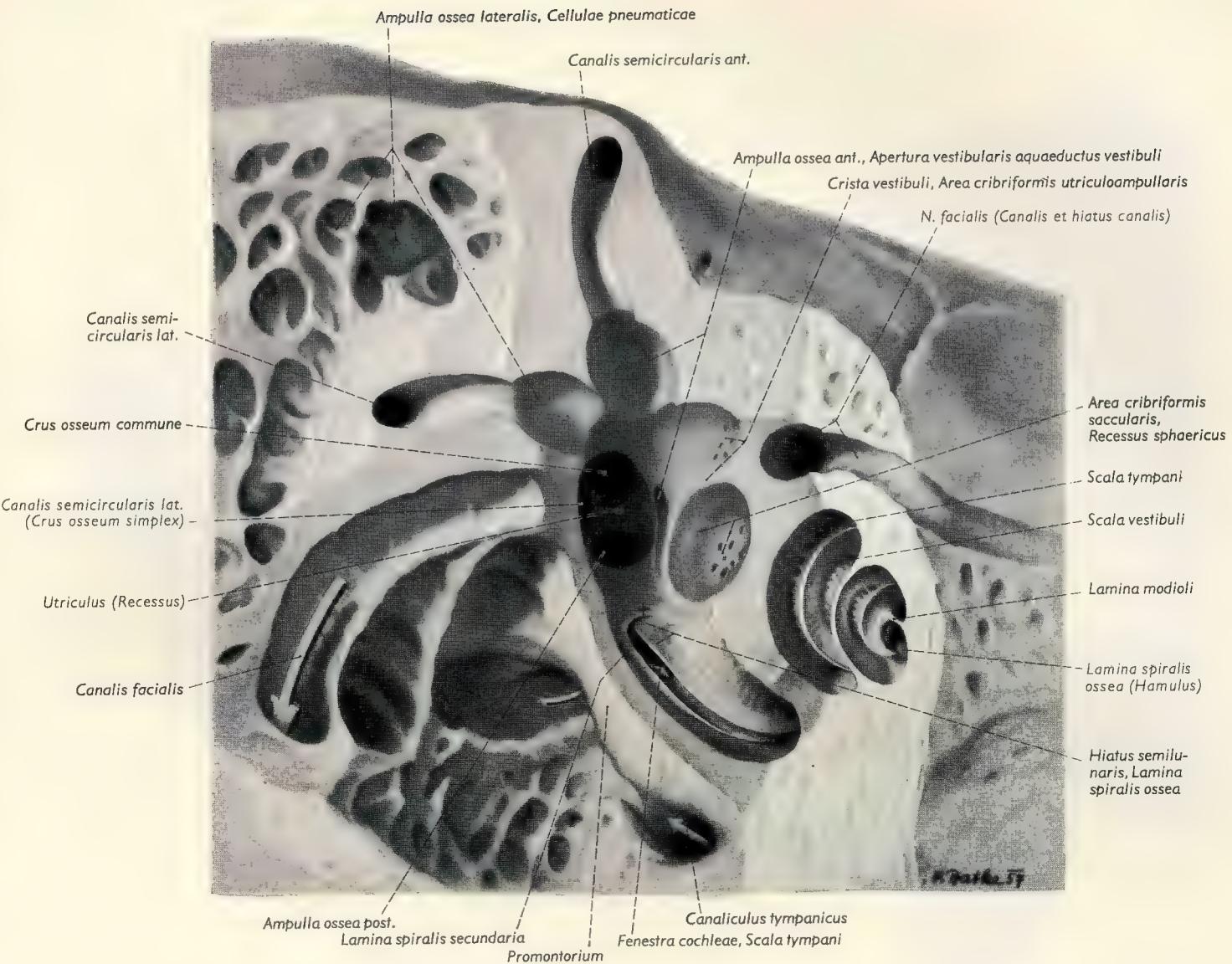


Fig. 193. A frontal section through the petrosal part of the right temporal bone showing the medial wall of the vestibule. The basal winding of the cochlea was opened so that scala vestibuli is facing the viewer.
Floor of the cochlear recess.

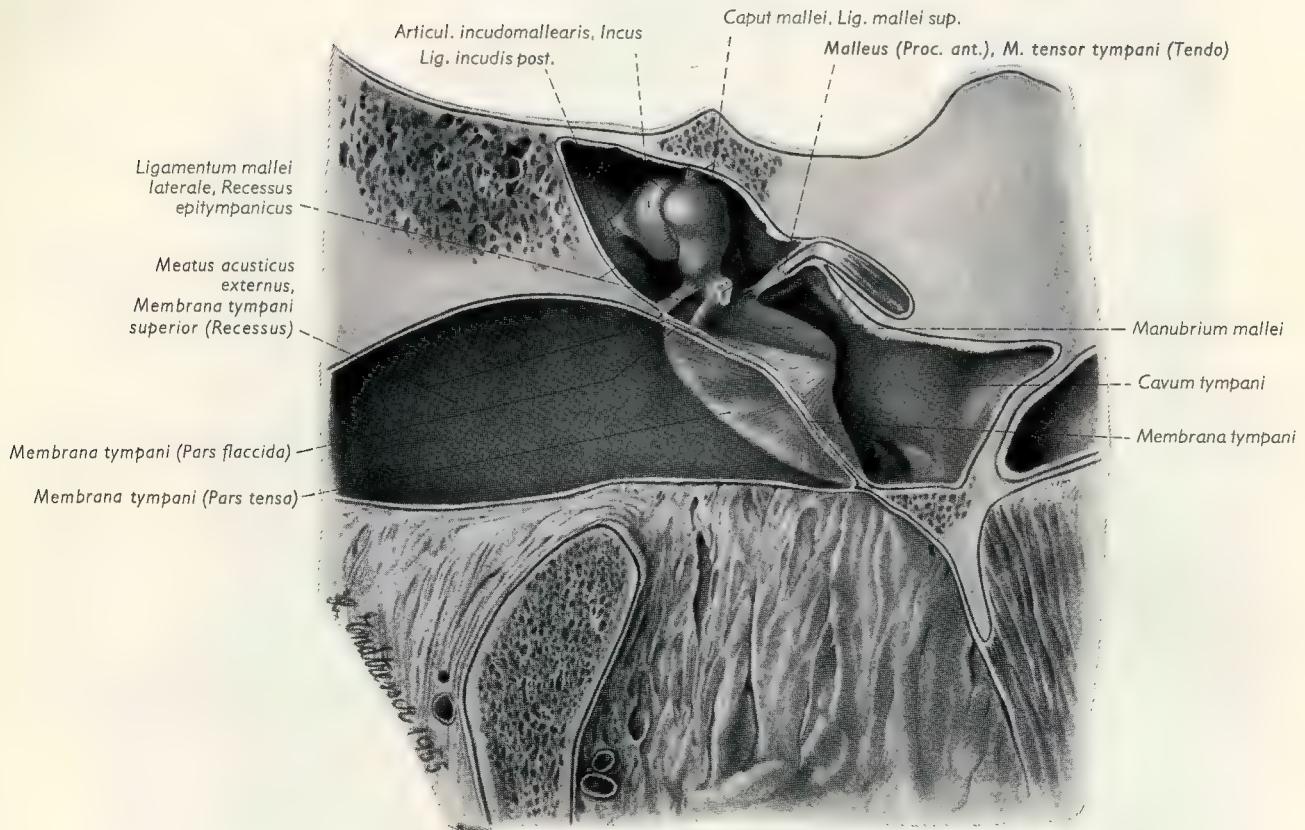


Fig. 194. Frontal section through the middle ear of the right side with mucosa and auditory ossicles.

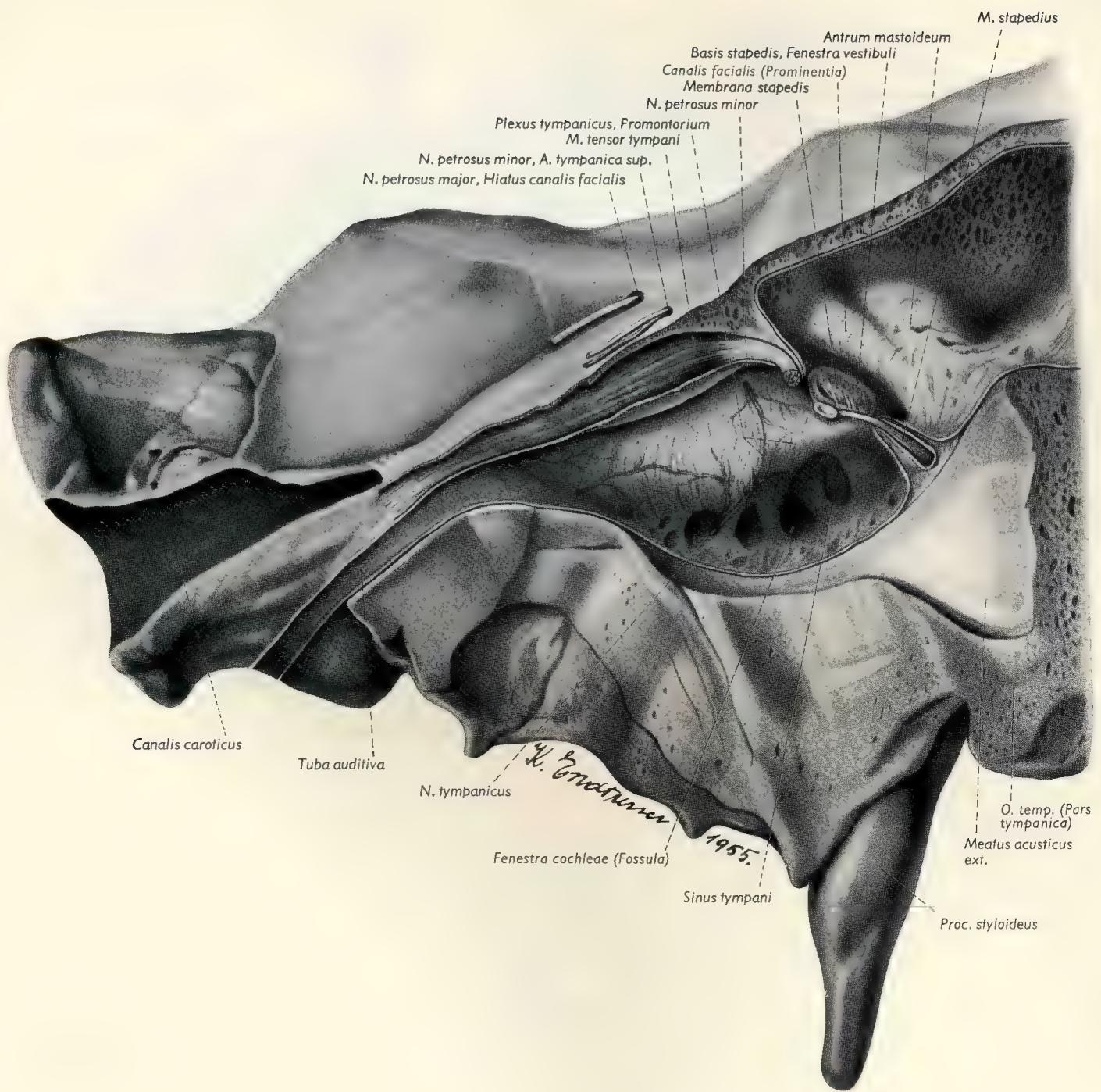


Fig. 195. Lateral view of the mucosal covering and muscles of the tympanic cavity.
The malleus and incus were removed; the stapes is in situ.

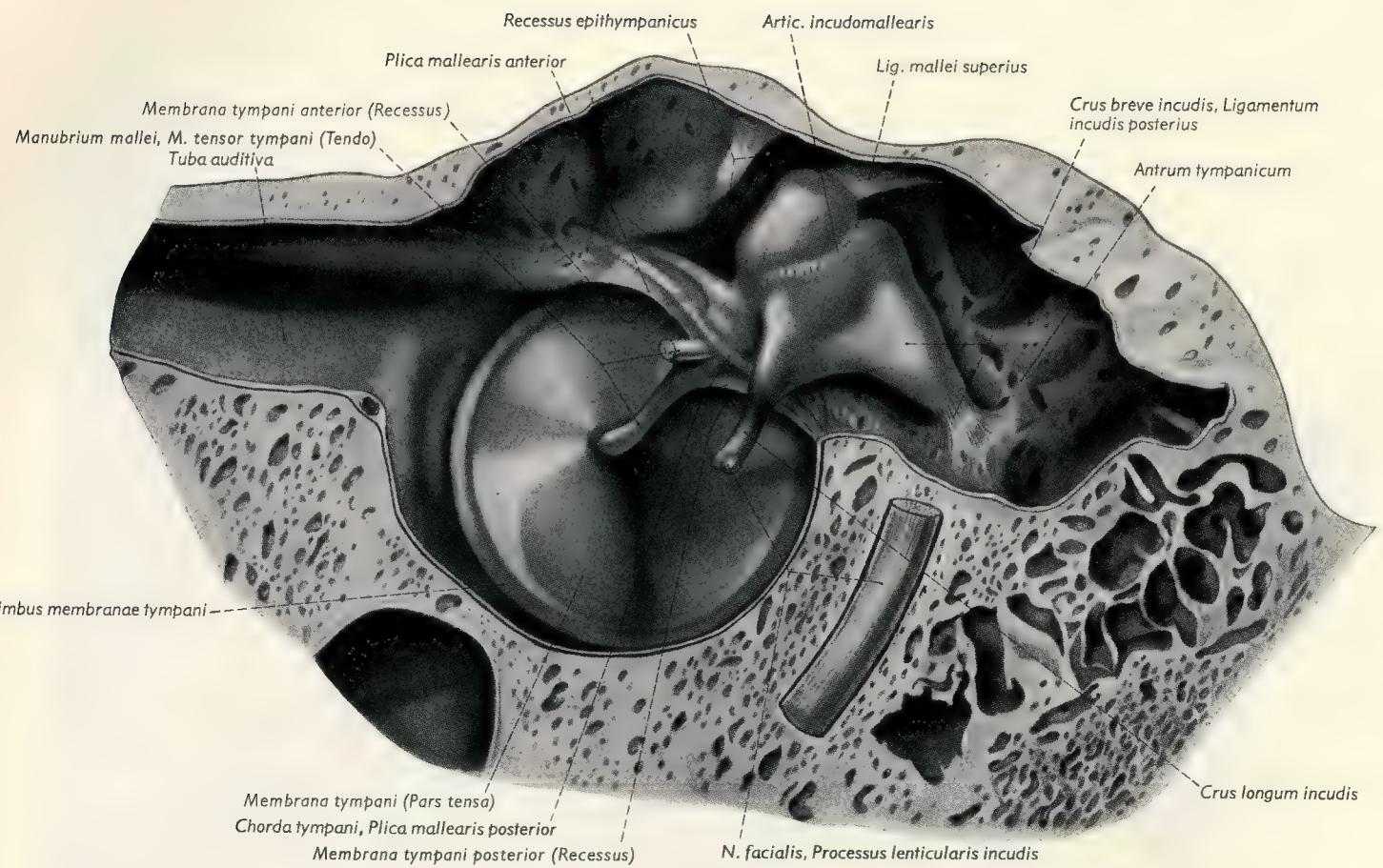
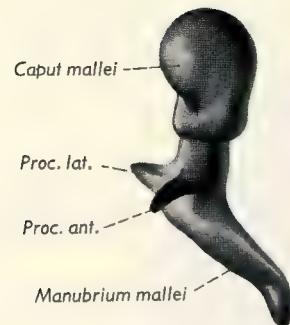
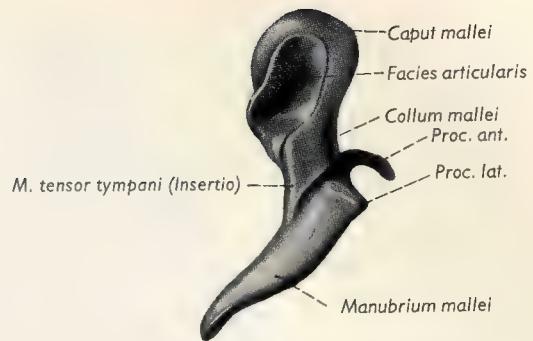


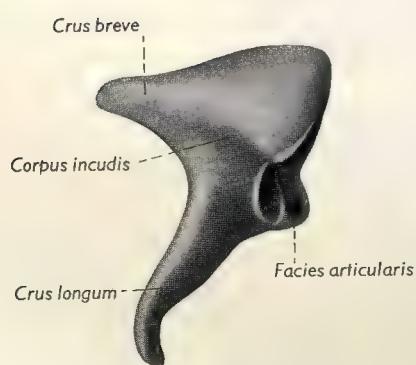
Fig. 196. The lateral wall of the right tympanic cavity. View of the tympanic membrane, the malleus, and the incus.



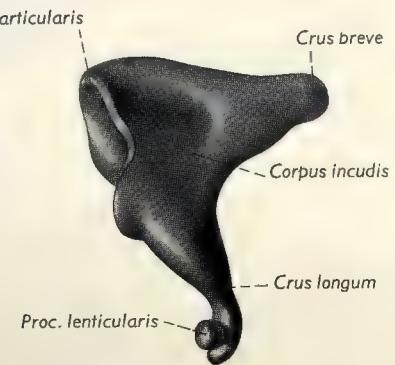
a) Right malleus from front.



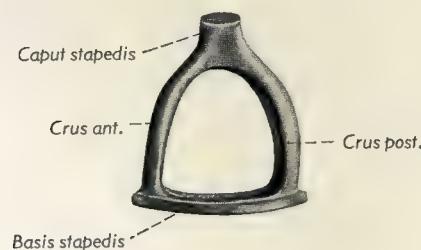
b) Right malleus from behind.



c) Right incus, anterolateral view.



d) Right incus, posteromedial view.



e) Right stapes.

Fig. 197. View of the three auditory ossicles, disarticulated.

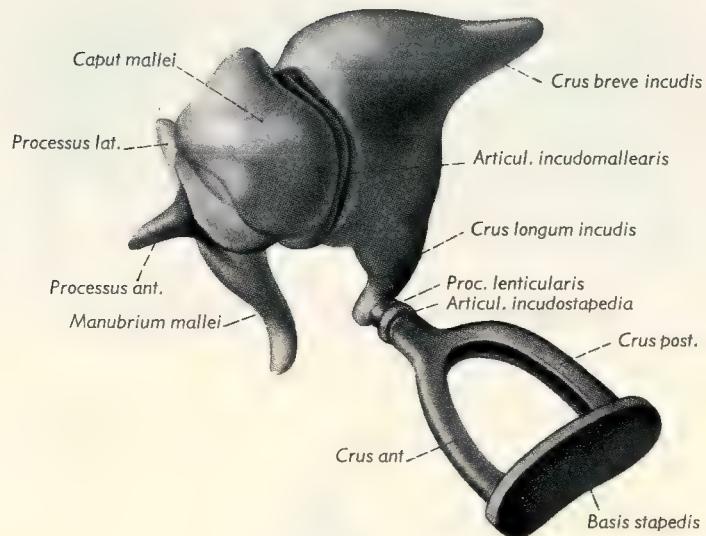
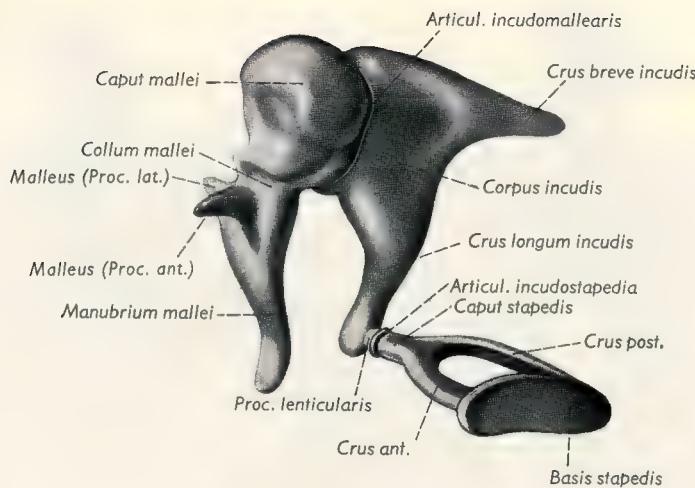


Fig. 198. (Top) The auditory ossicles of the right ear, medial view.

Fig. 199. (Bottom) The three articulated auditory ossicles, seen from above.

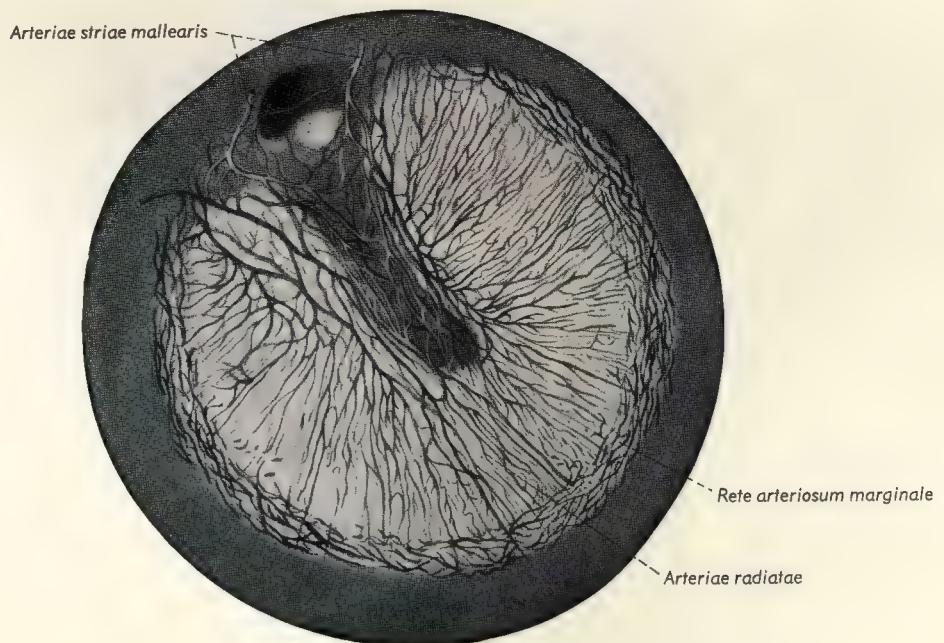
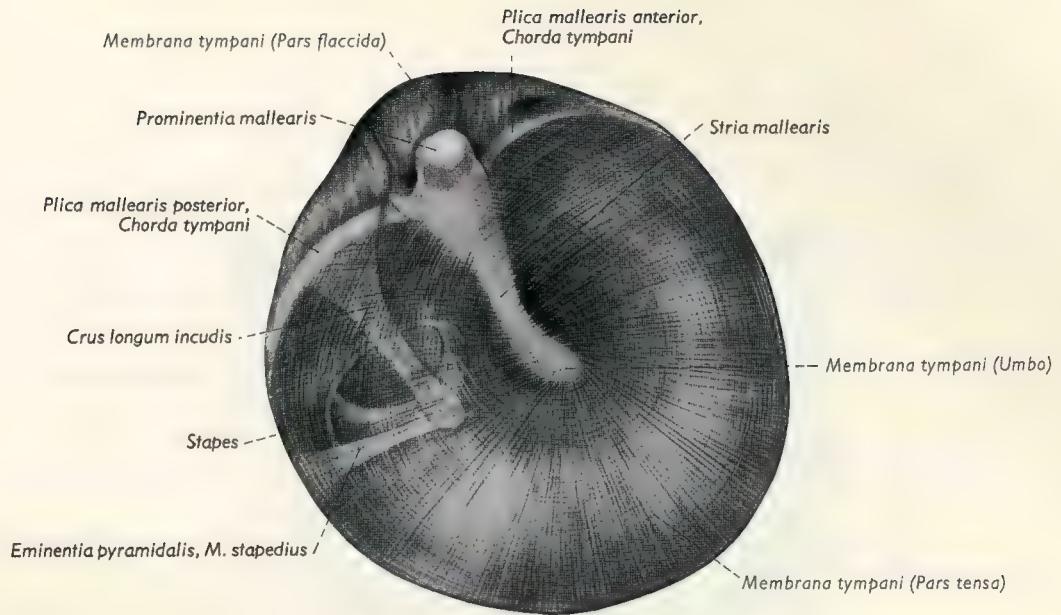
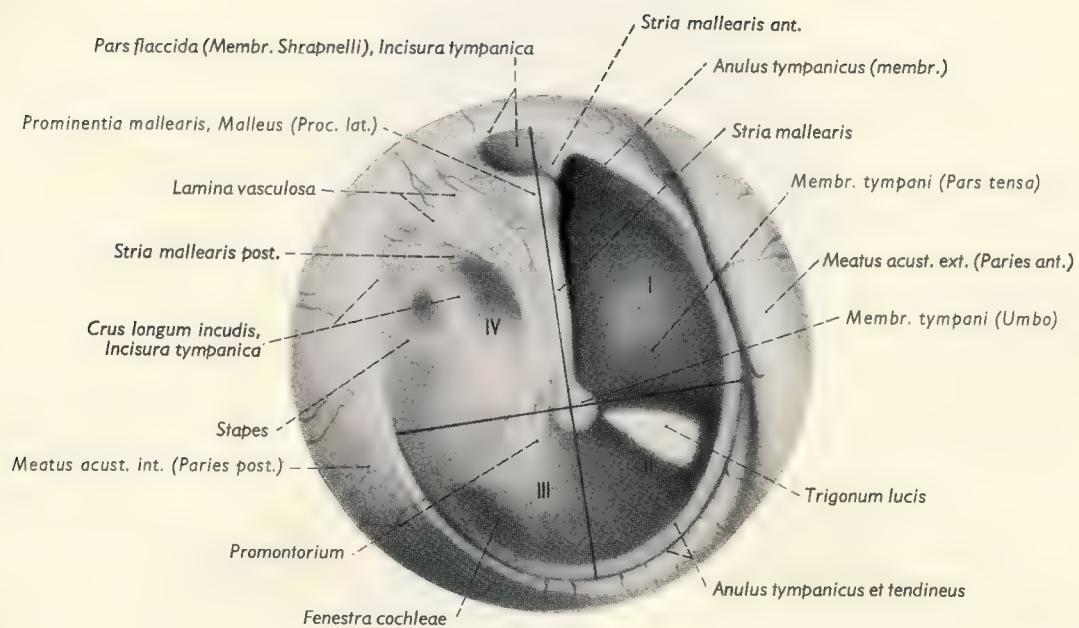


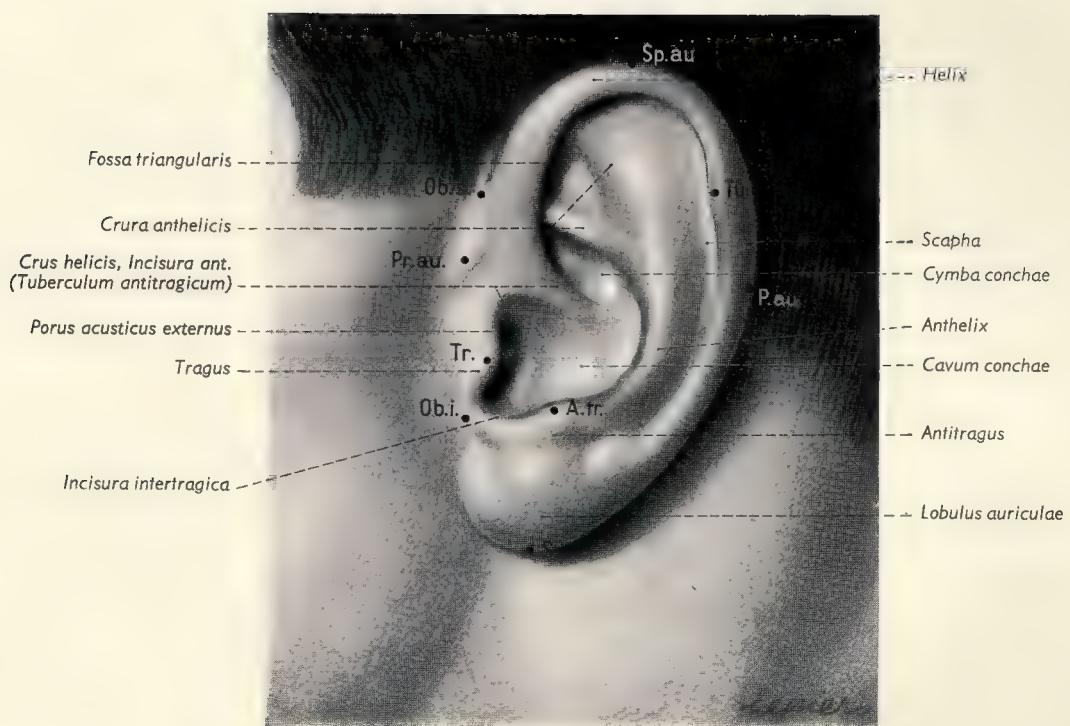
Fig. 200. (Top) The three auditory ossicles projected on the right eardrum to show their location, lateral view.

Fig. 201. (Bottom) The eardrum with its arteries.



I = Anterior superior quadrant of eardrum
 II = Anterior inferior quadrant of eardrum
 III = Posterior inferior quadrant of eardrum
 IV = Posterior superior quadrant of eardrum

Fig. 202. Otoscopic view of right eardrum (from von Eicken-Schultz v. Treeck).



A.tr = Antitragion
 Ob.s = Otobasion sup.
 Ob.i = Otobasion inf.
 P.au = Postauriculare
 Pr.au = Praearticulare

S.au = Subauriculare
 Sp.au = Supraauriculare
 Tr = Tragion
 Tu = Tuberculum Darwini

Fig. 203. Lateral auricular region (external ear).
The surface within the auricle.

The Eye and the Orbit

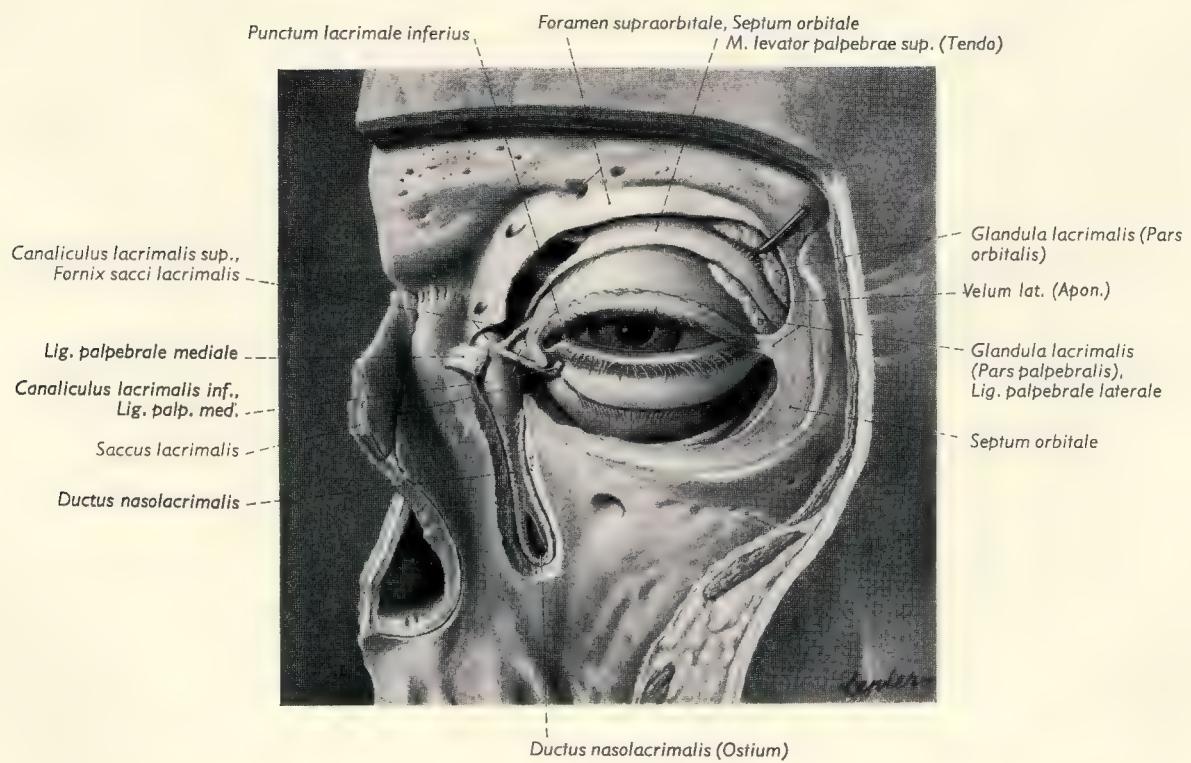
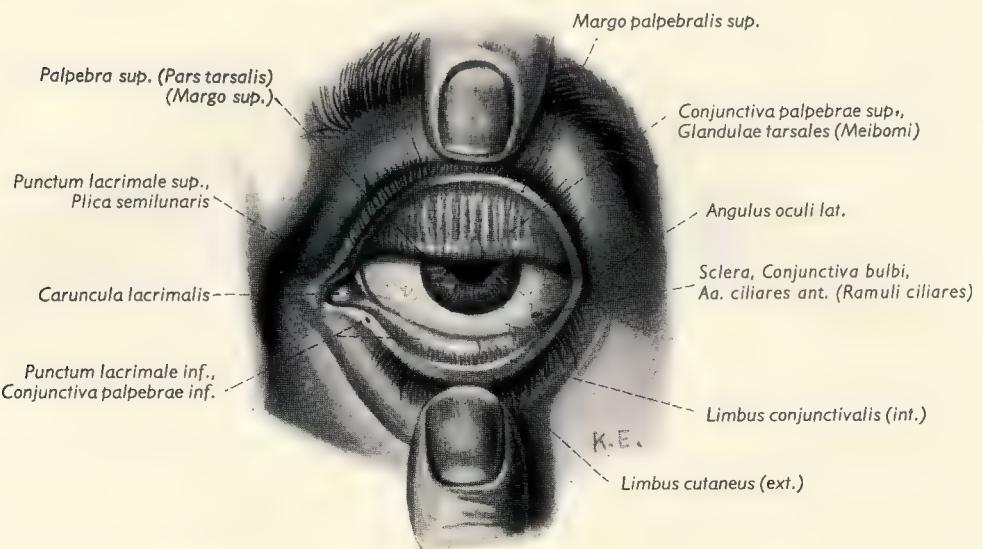
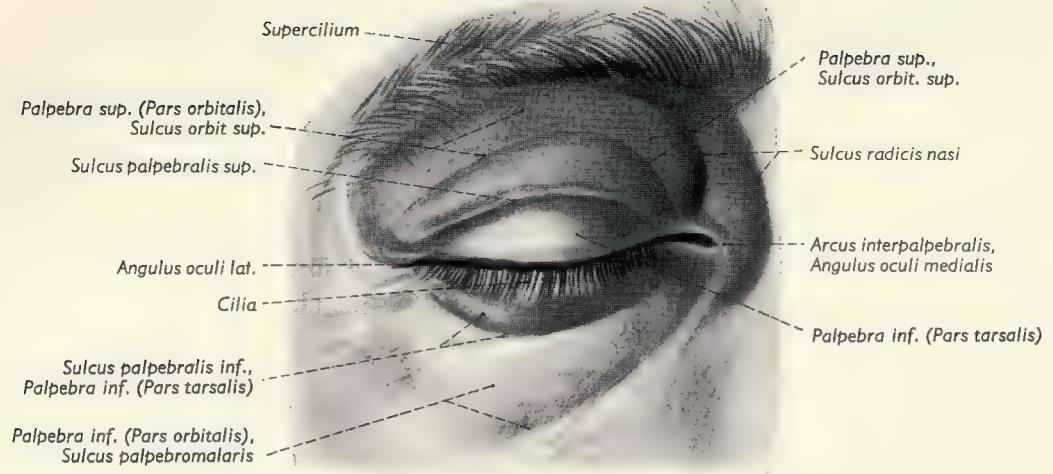


Fig. 204. (Top) External features of right eye region.

Fig. 205. (Middle) External features of the left eye region. The upper lid is completely inverted; the lower lid is pulled down:

Fig. 206. (Bottom) The lacrimal apparatus and the tarso-orbital septum (partly resected).

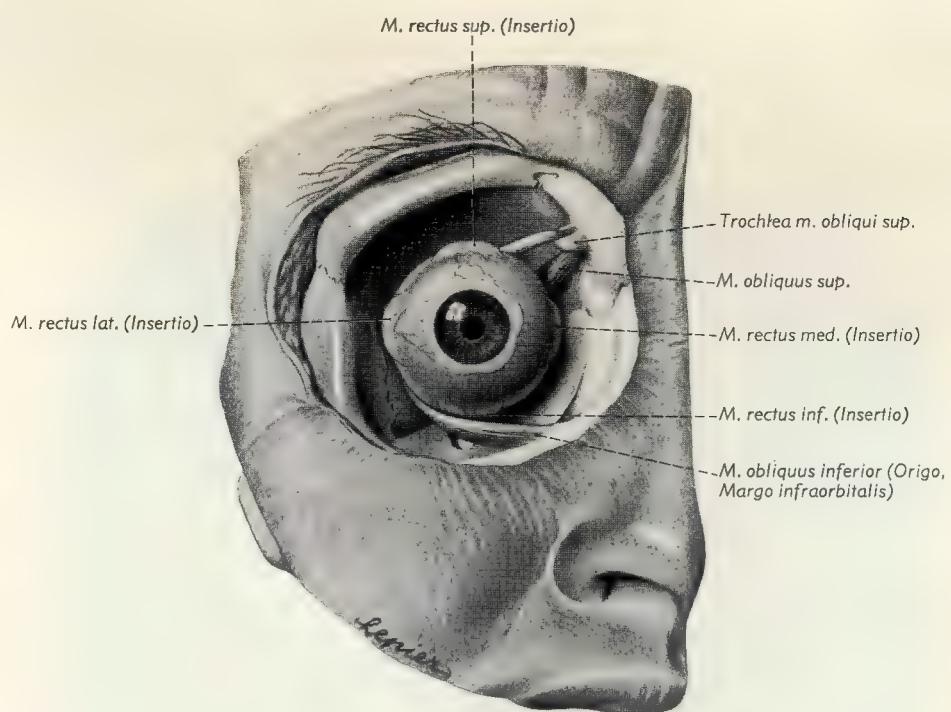
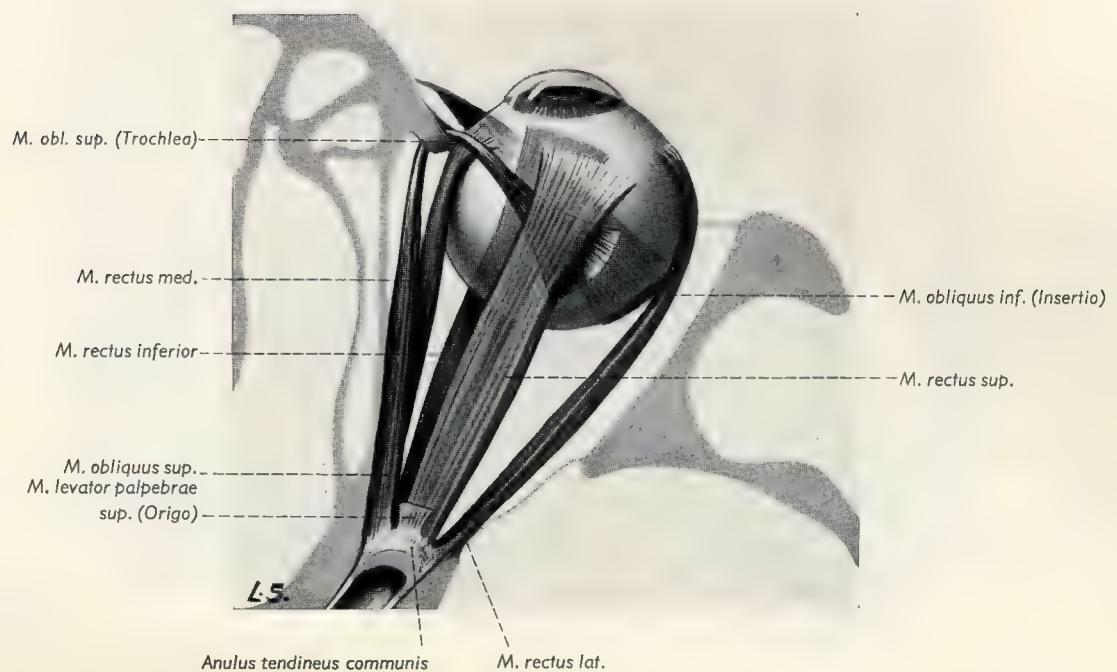


Fig. 207. (Top) Schematic view of the muscles of the right eyeball seen from above. The muscles are drawn partly transparent. Note the deviation of the bulbar axis and the components of the muscle "pyramid."

Fig. 208. (Middle) Muscles of the right eyeball seen from front.

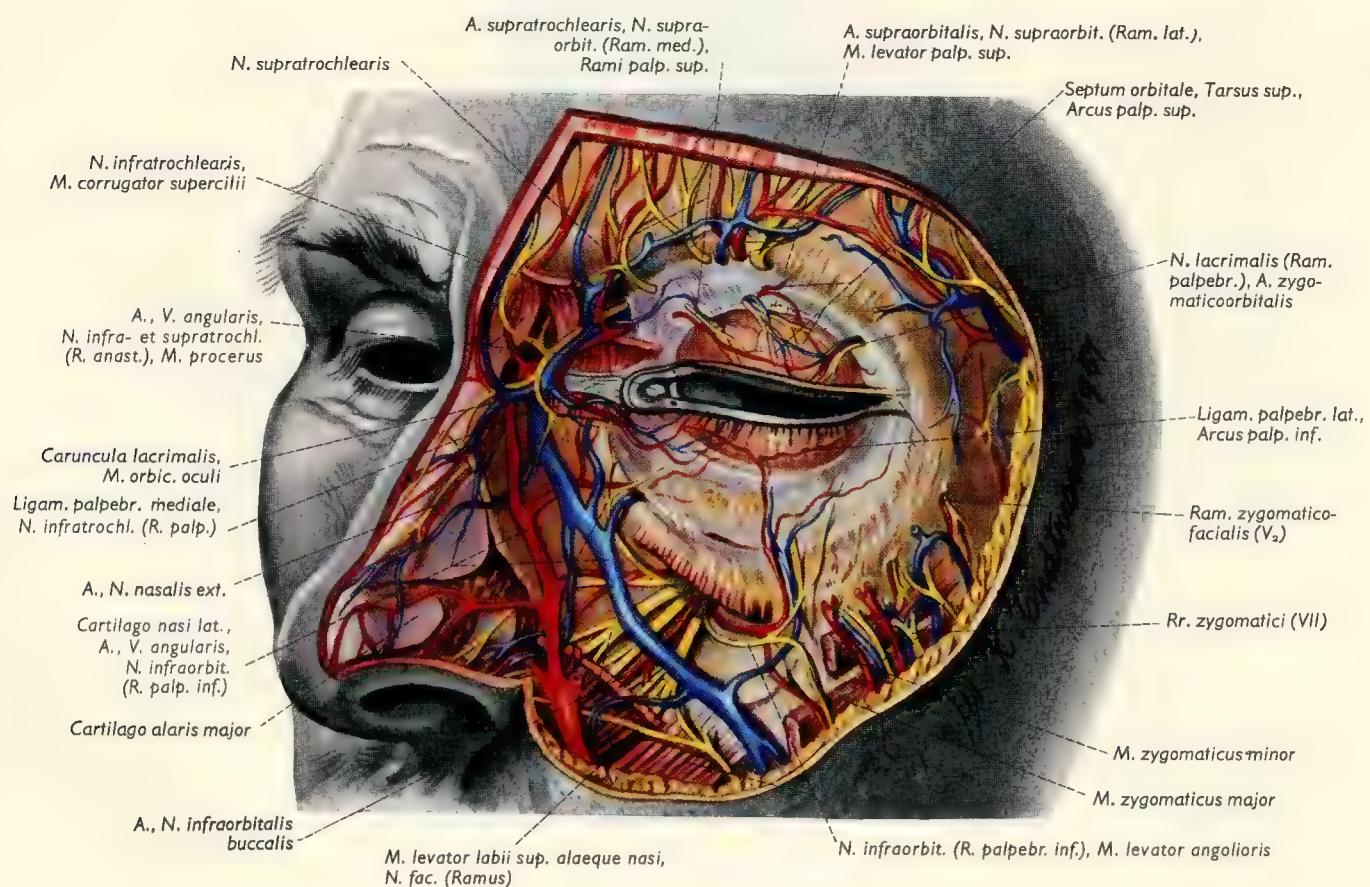
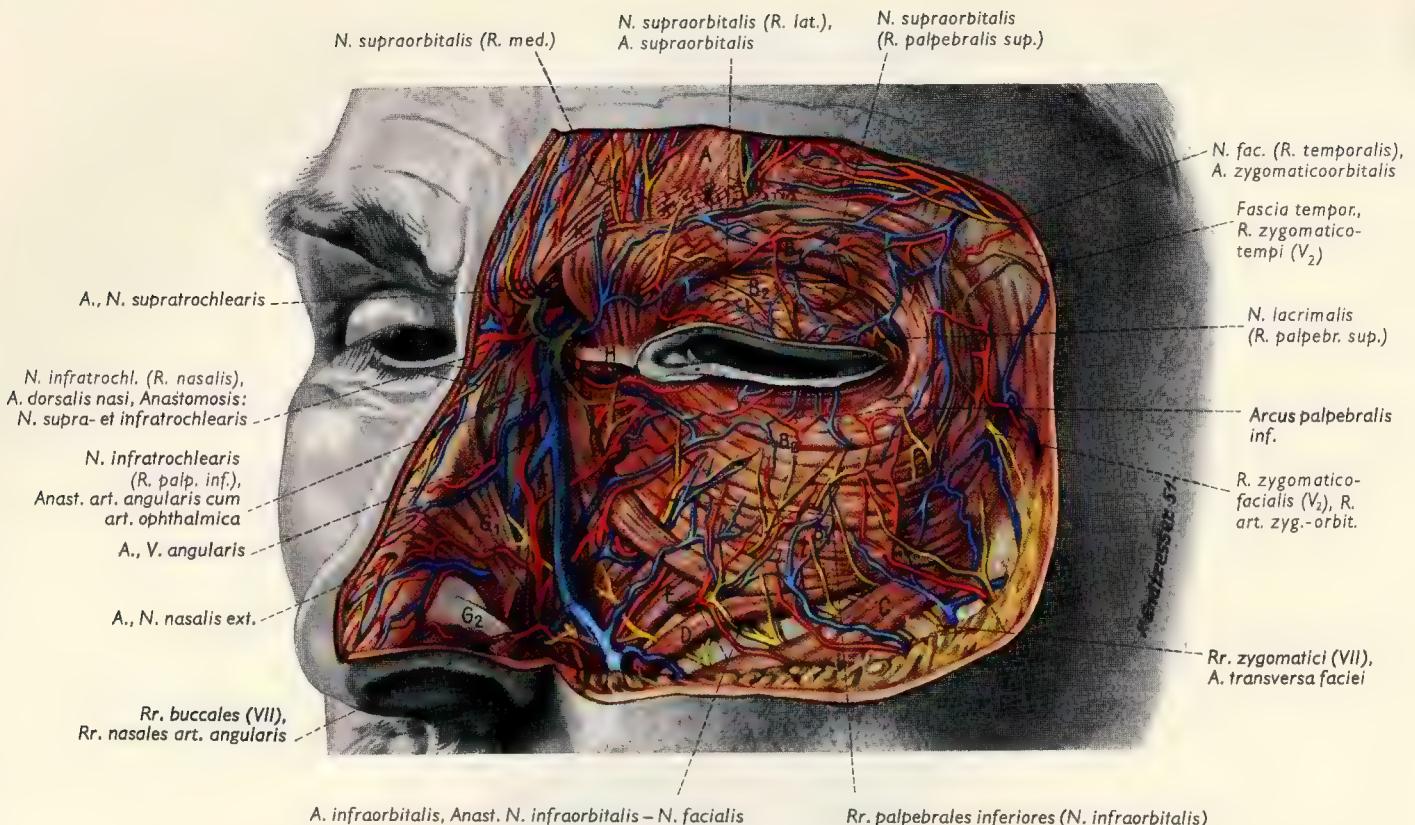


Fig. 209. (Top) Vessels, nerves, and muscles in the superficial eye and nose regions.

Fig. 210. (Bottom) Vessels and nerves of the face in the deeper eye and nose regions after partial removal of the mimic musculature.

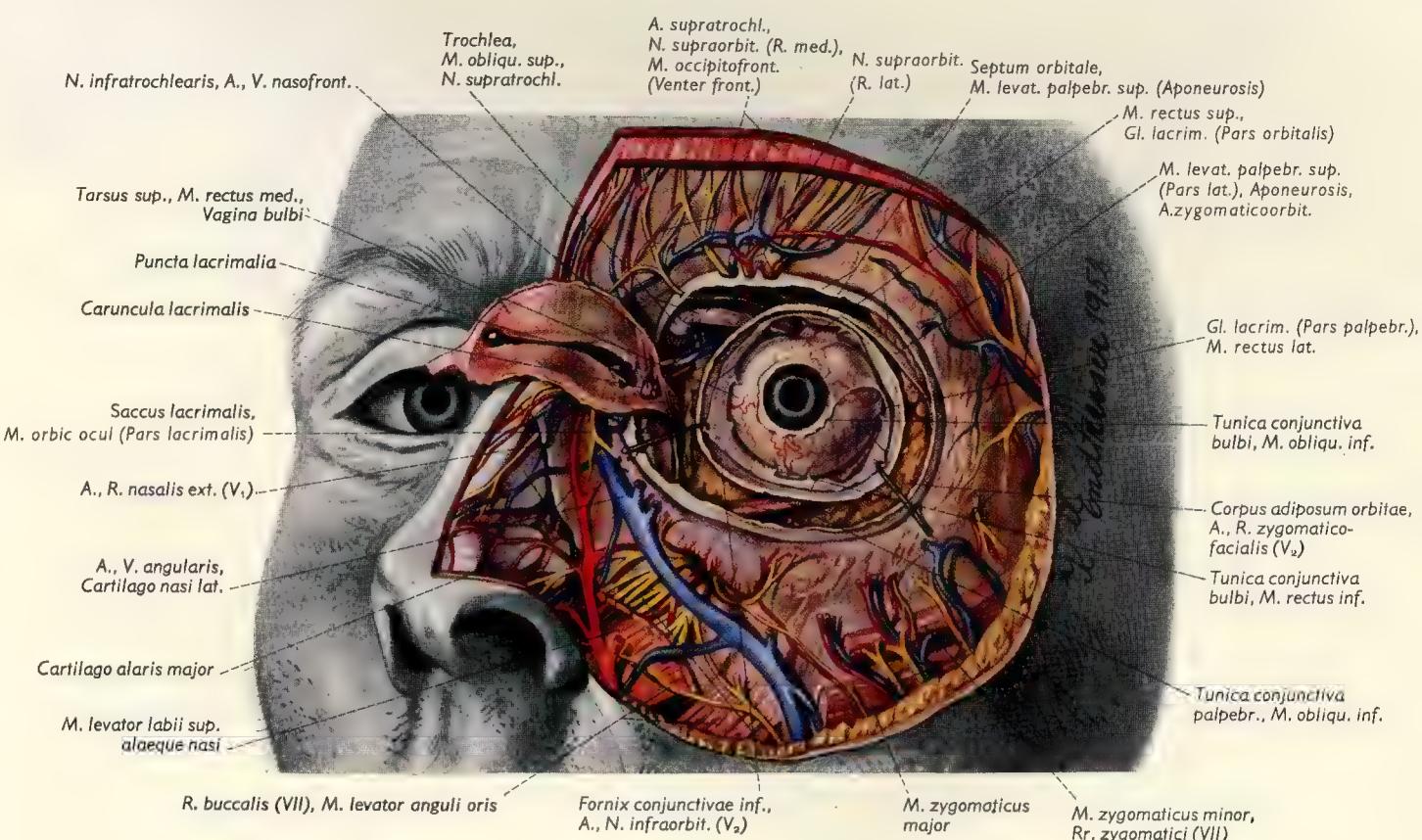
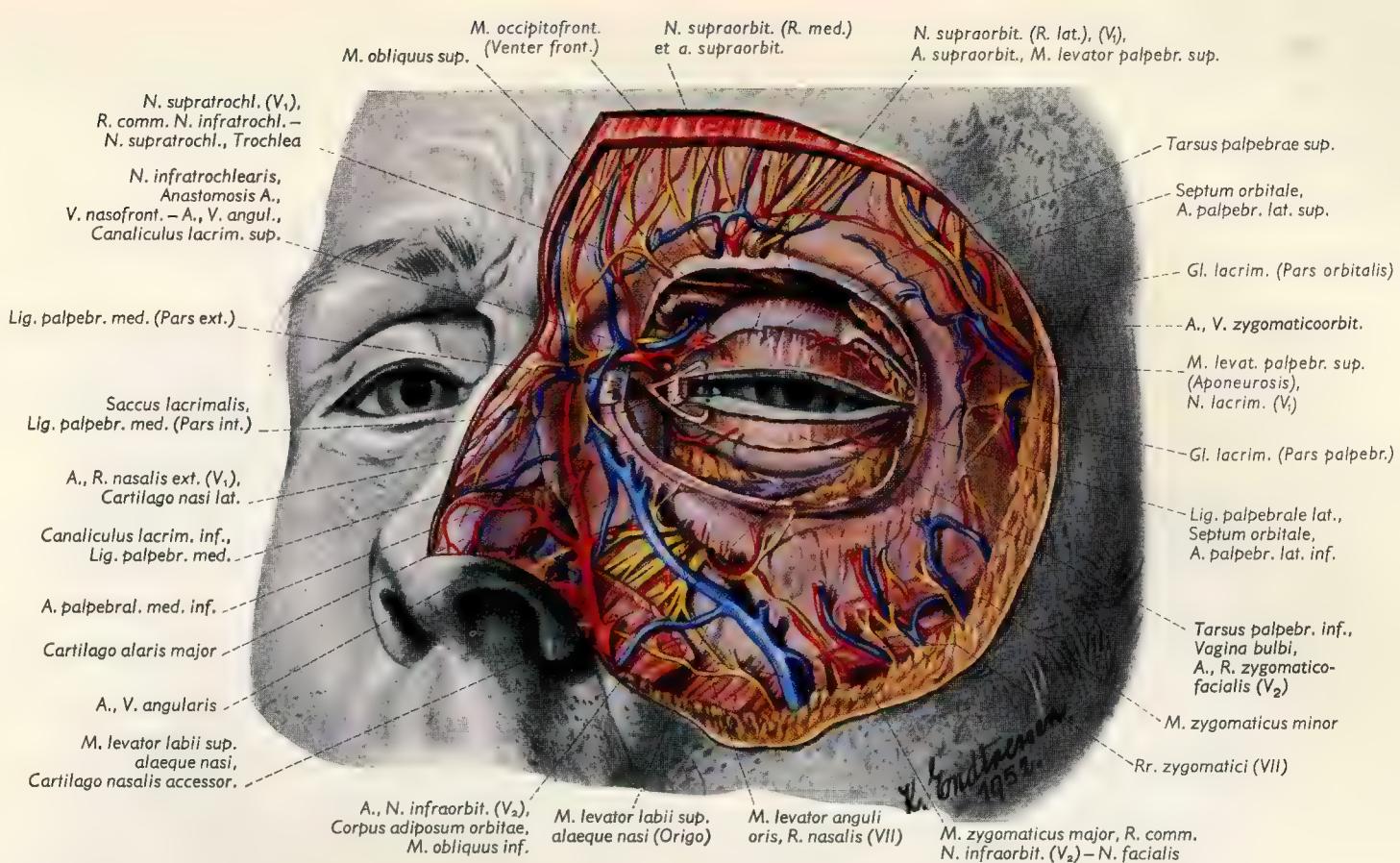


Fig. 211. (Top) Blood vessels and nerves of the deep eye region and lateral aspect of nose seen from front.

Fig. 212. (Bottom) Ocular bulb in situ, from front. The orbital septum is incised and the upper and lower tarsal plates are reflected medially.

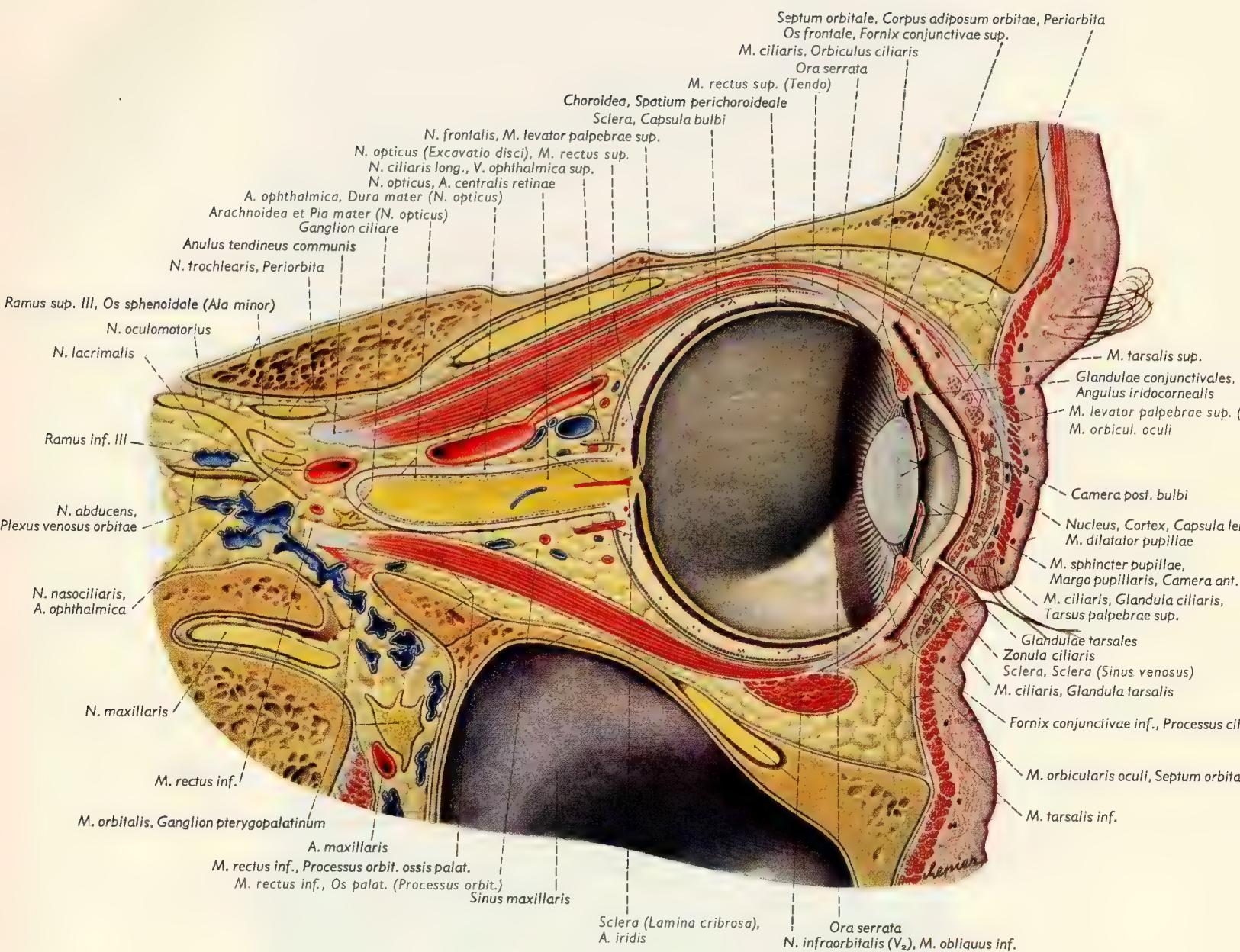


Fig. 213. Lateral view of a sagittal section through the orbit with contents.

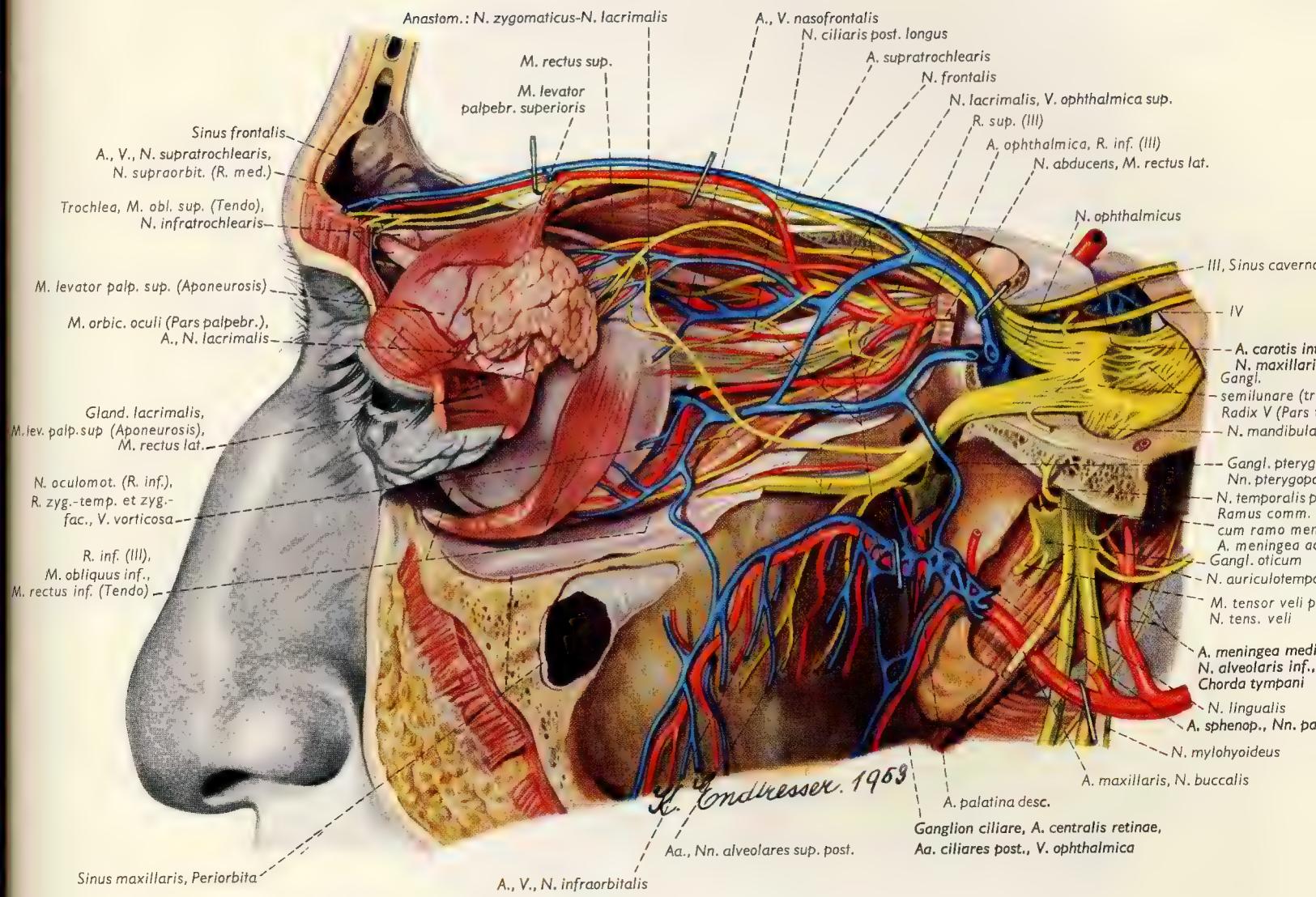
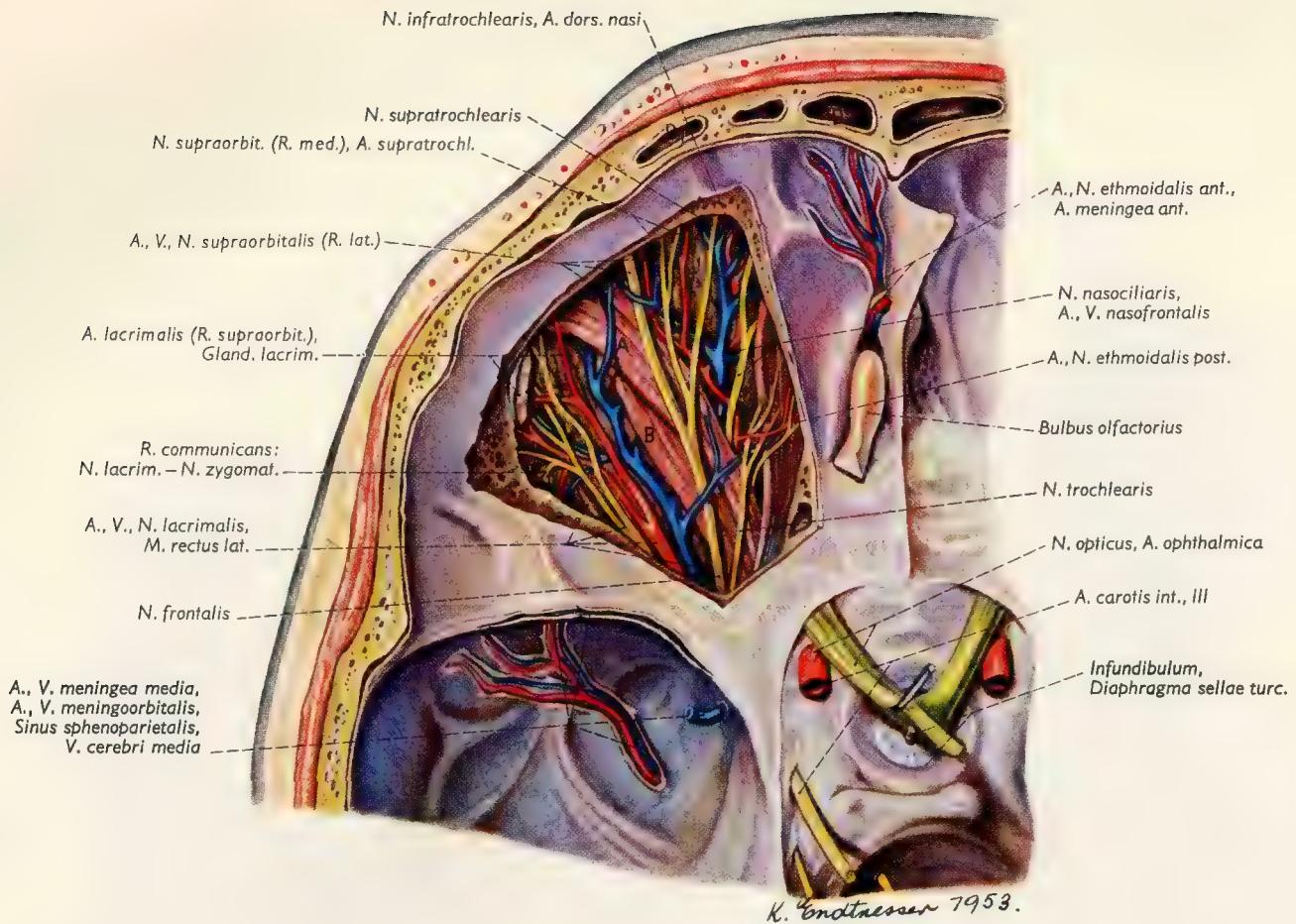


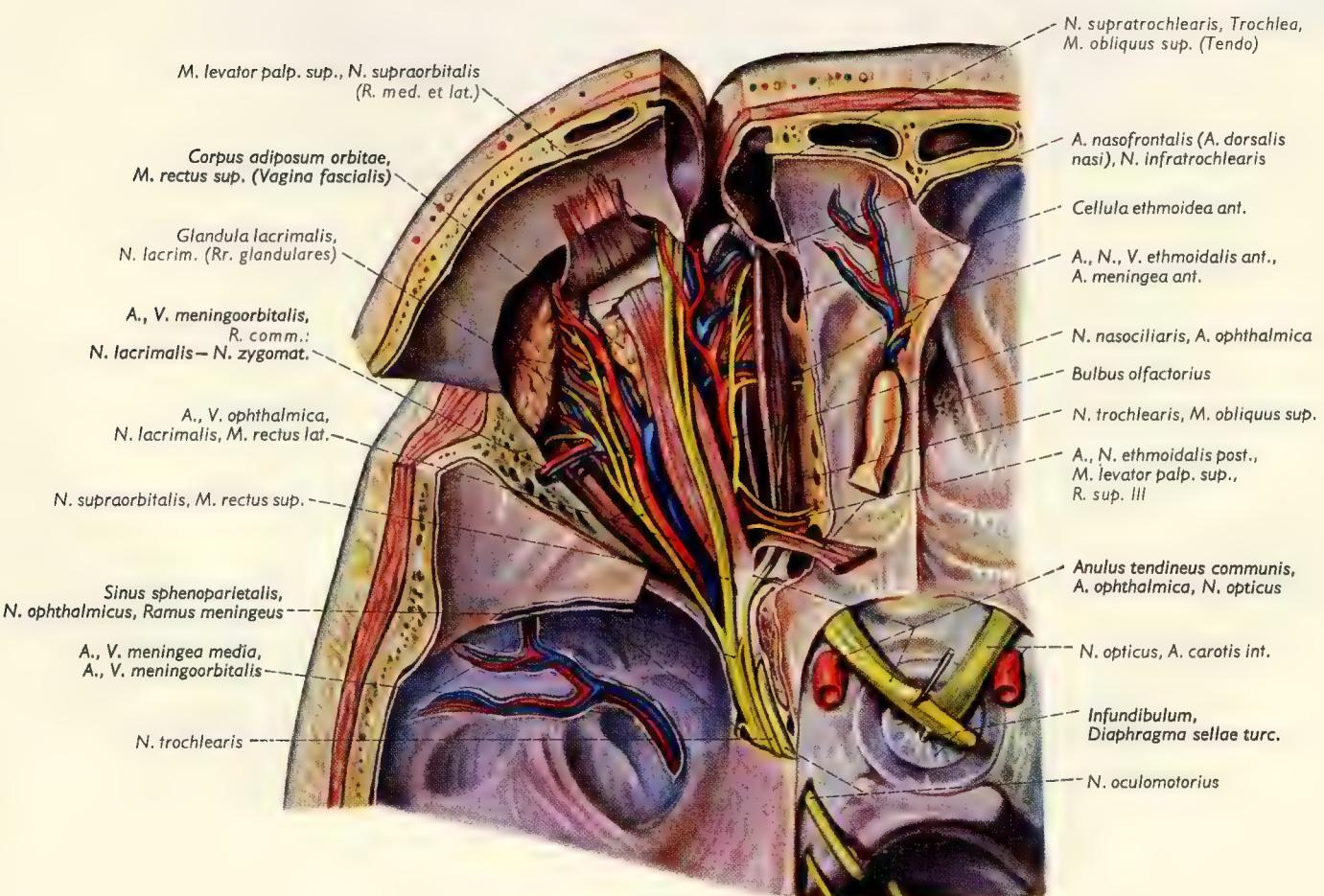
Fig. 214. Contents of left orbit, lateral view. The orbital fat has been removed.
Pterygopalatine fossa with the pterygopalatine ganglion.



A = M. levator palp. sup.
B = M. rectus sup.

C = M. obliquus sup.
D = Sinus frontalis

D₁ = Sinus frontalis (Recessus lat.)
E = Cellula ethmoidea post.



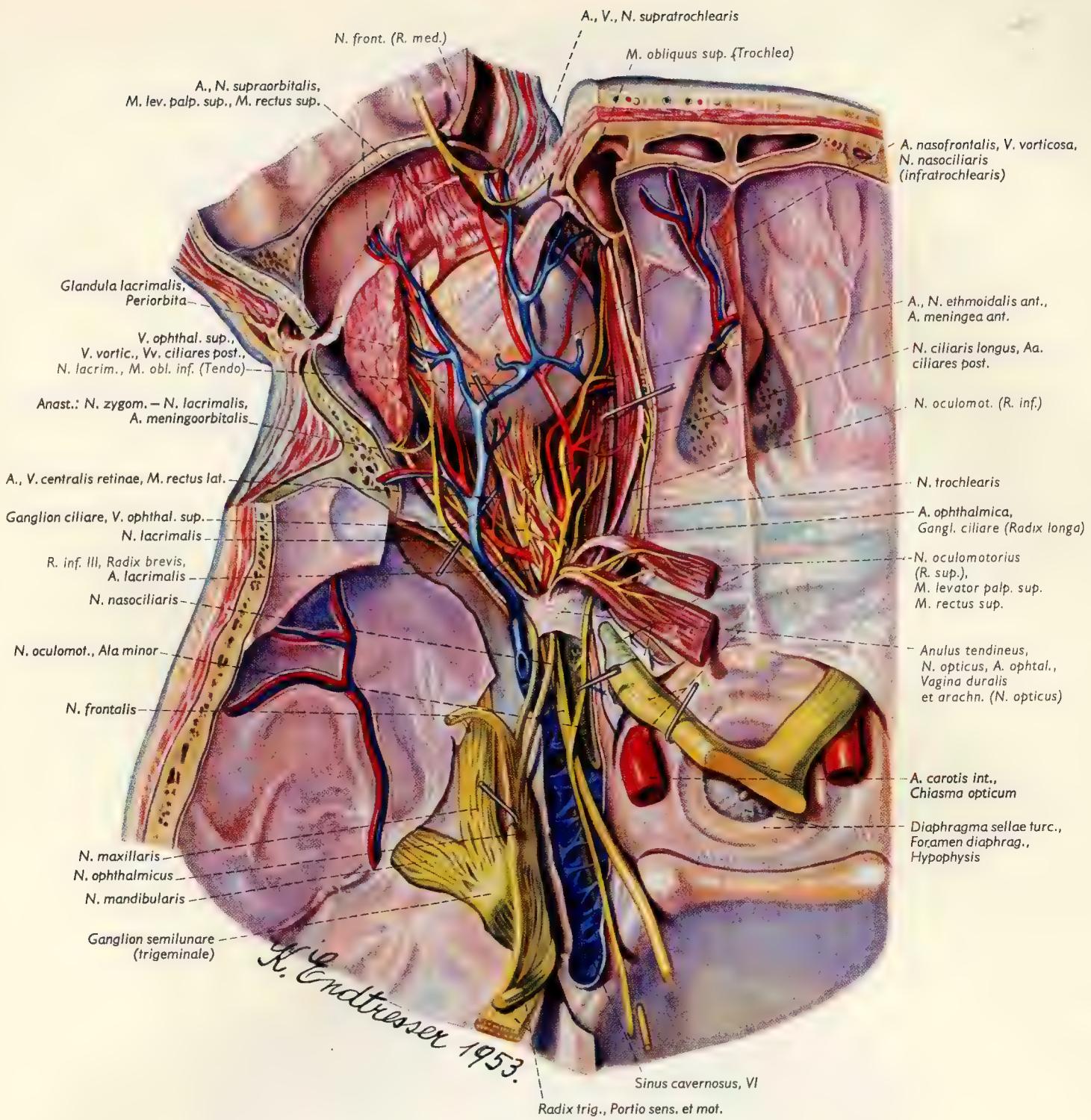
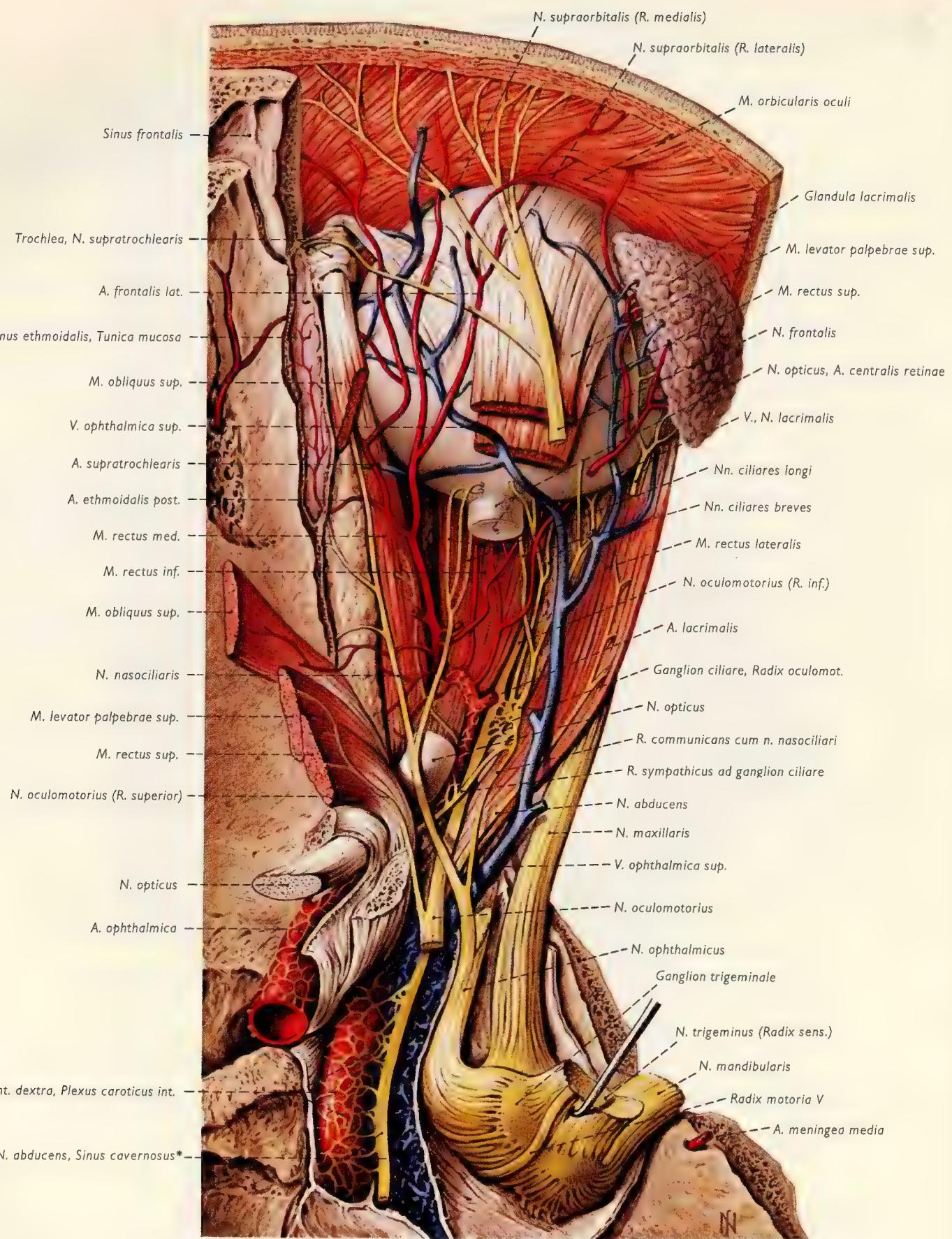


Fig. 217. Orbital contents from above after removal of the roof and opening the sup. orbital fissure.
The levator palp. sup. has been cut and reflected back.

Fig. 215. (Left, top) View of muscles, nerves, and vessels of the orbit from above after removal of the orbital roof.

Fig. 216. (Left, bottom) Orbital contents from above after removal of the orbital roof. The nerves in the region of the cavernous sinus. Area of the hypophysis from above.



* = Branching sympathetic fibers to the abducens n. from the internal carotid plexus in the cavernous sinus.

Fig. 218. Right orbit, opened from above. The superior orbital wall and squama of the frontal bone have been removed to show the branching of the 1st division of the trigeminal nerve. The semilunar ganglion and the trigeminal nerve are elevated.

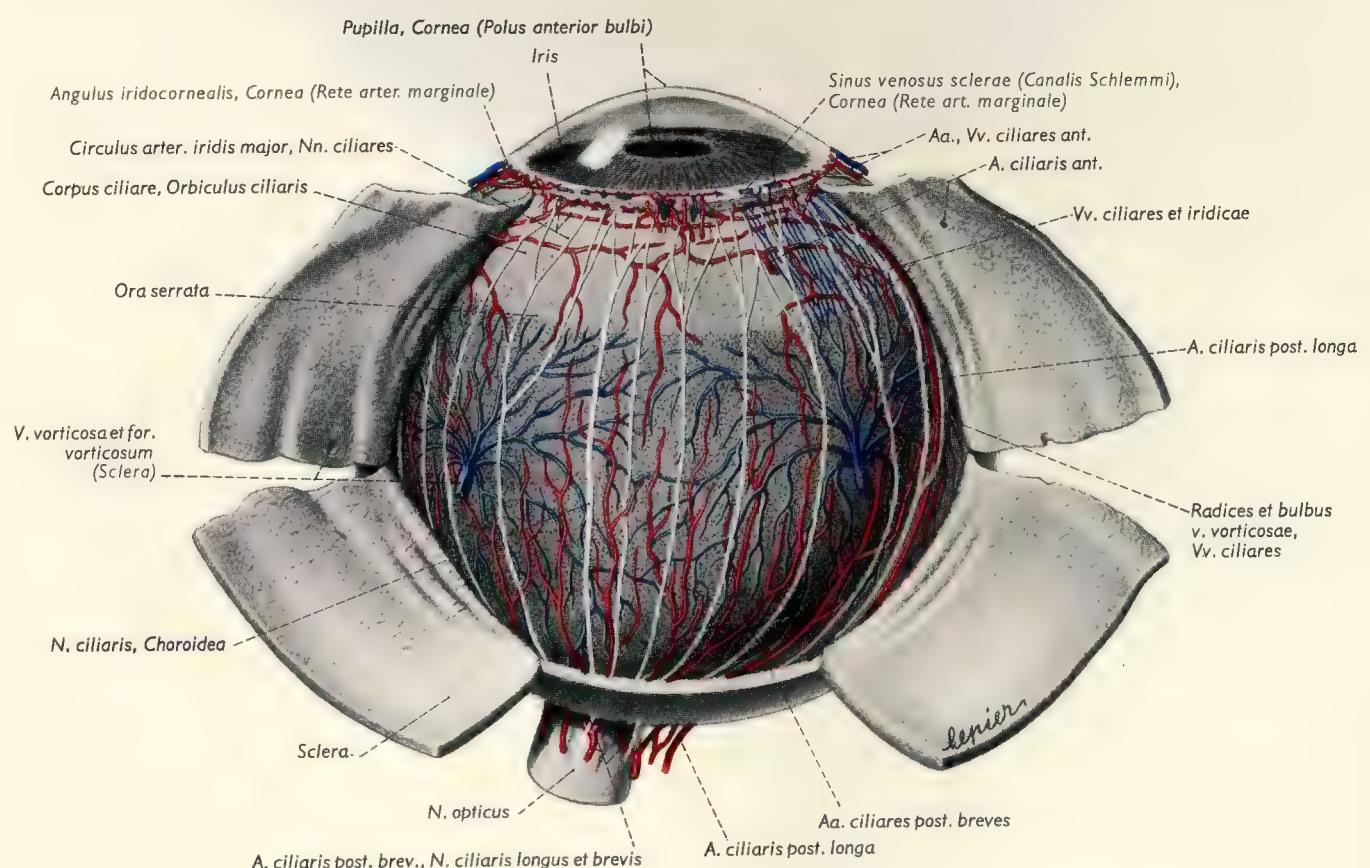
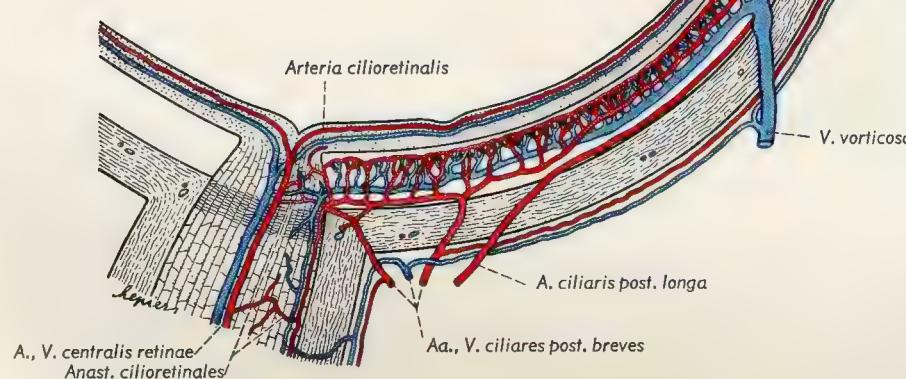
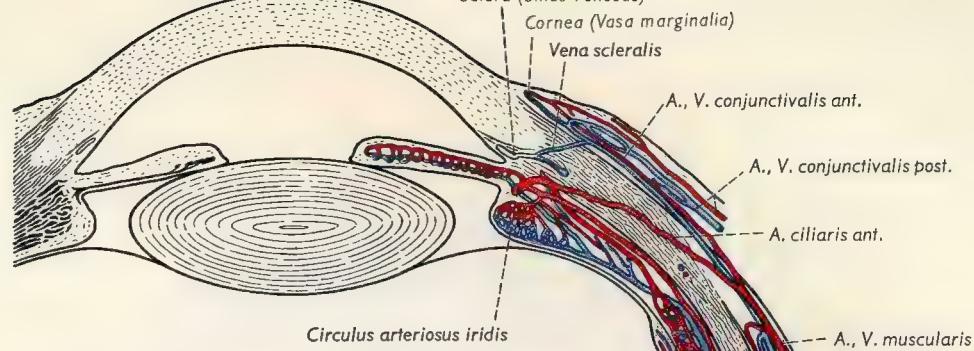


Fig. 219. (Top) Blood vessels of the bulb; schematic (from Th. Leber).

Fig. 220. (Bottom) Right ocular bulb seen from above. The sclera is reflected, exposing the vessels and nerves of the vascular tunic of the bulb.

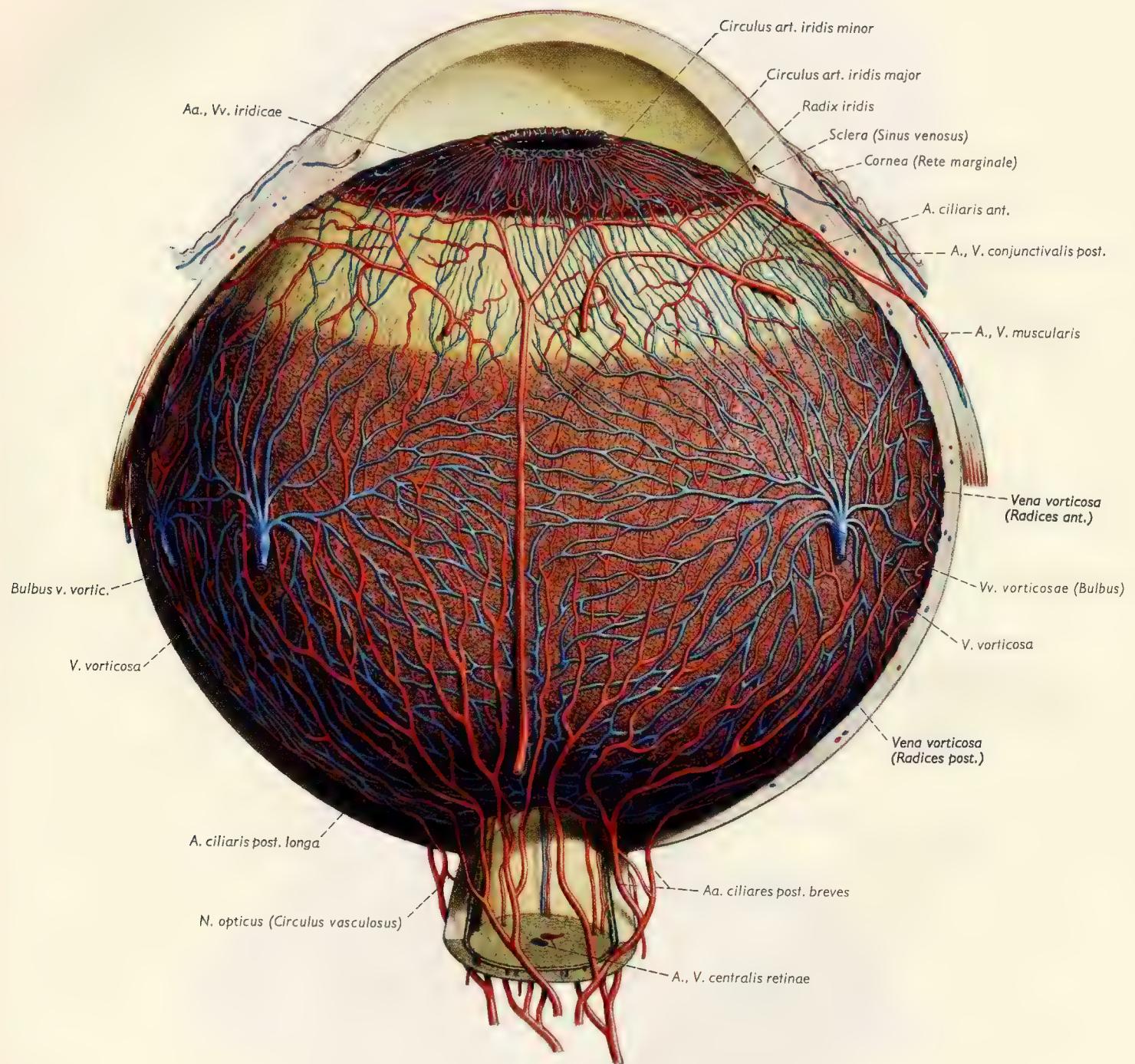


Fig. 221. Blood vessels in the middle layer of the bulb.

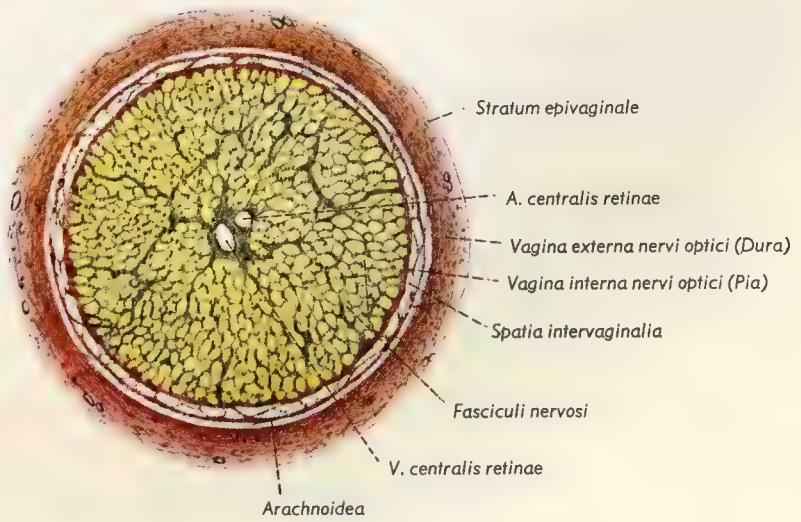
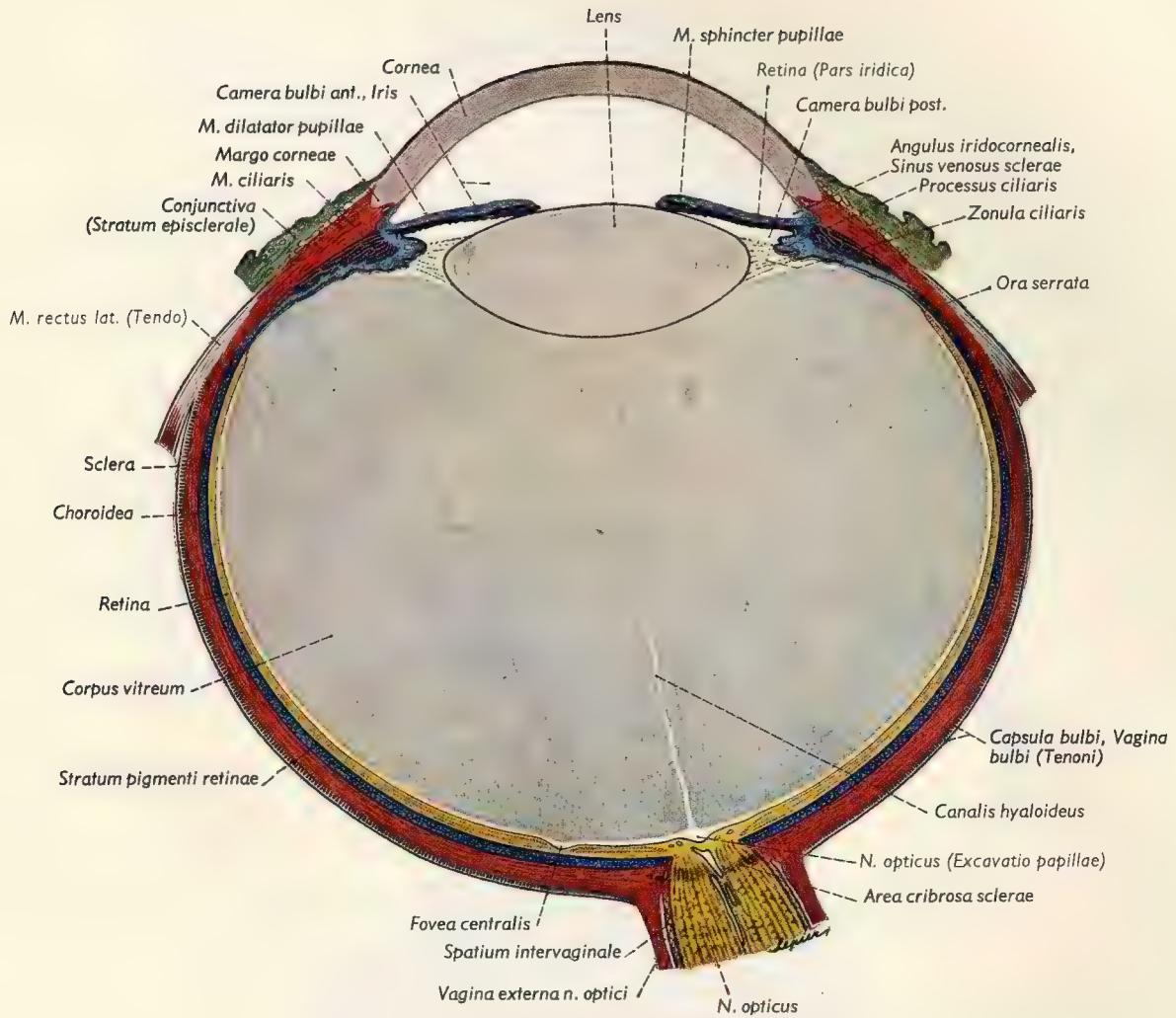


Fig. 222. (Top) Horizontal section through the left bulb. The layers of the bulbar wall are indicated by different colors.

Fig. 223. (Bottom) Cross section through the anterior part of the optic nerve.

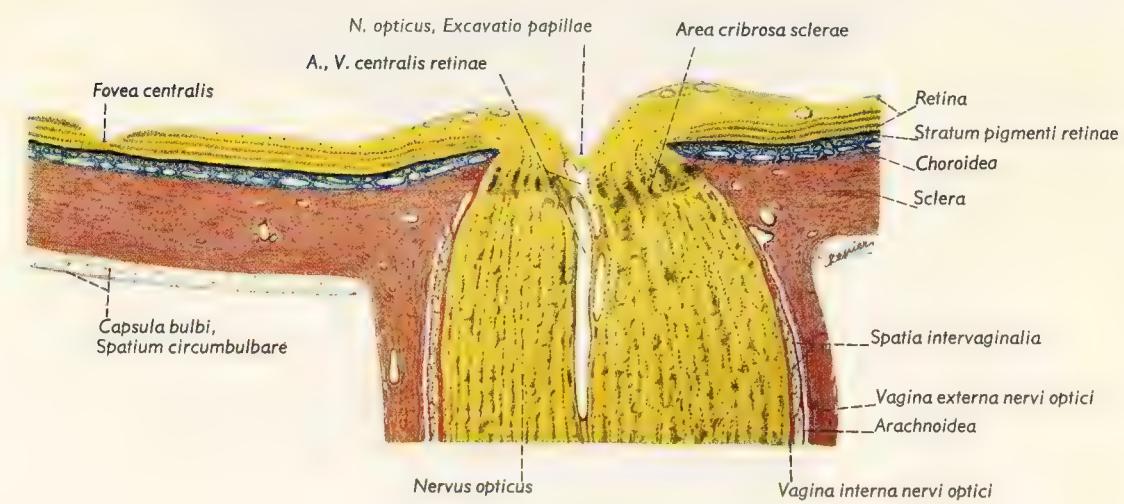
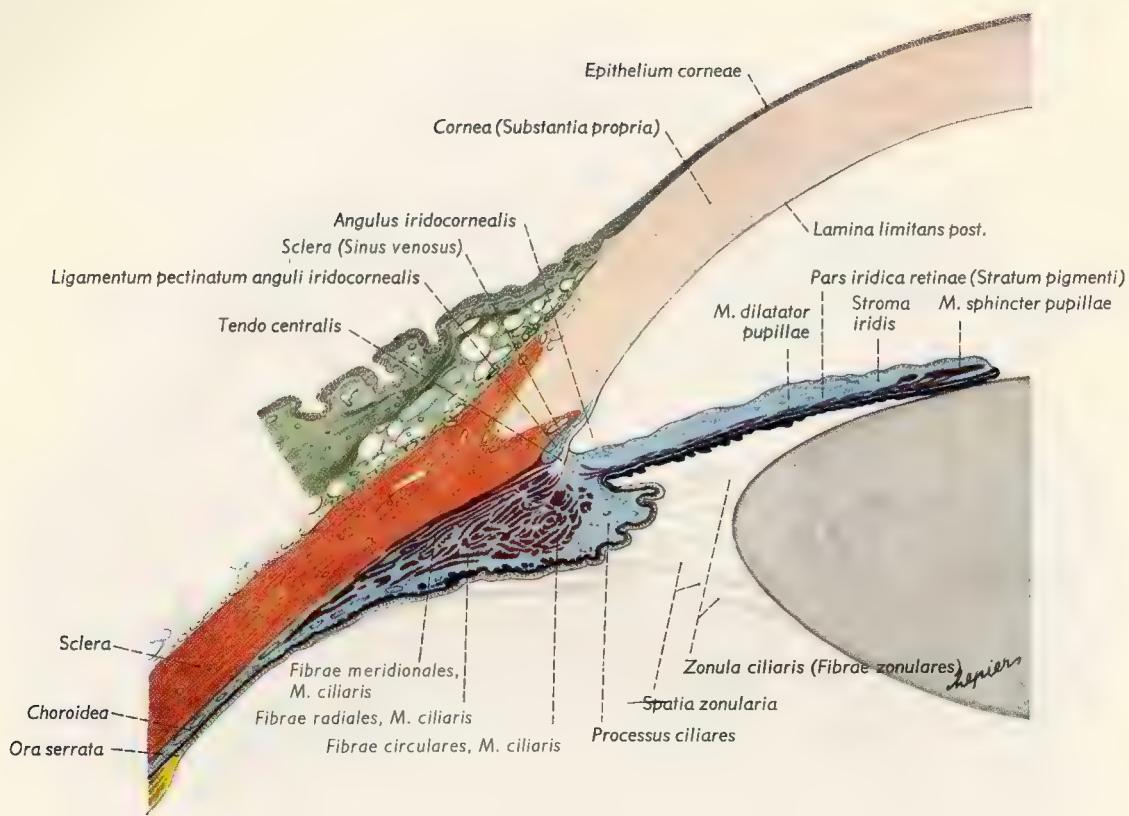


Fig. 224. (Top) Horizontal section through the optic nerve at its point of entrance into the bulb.

Fig. 225. (Bottom) Horizontal section through the anterior portion of the bulb.

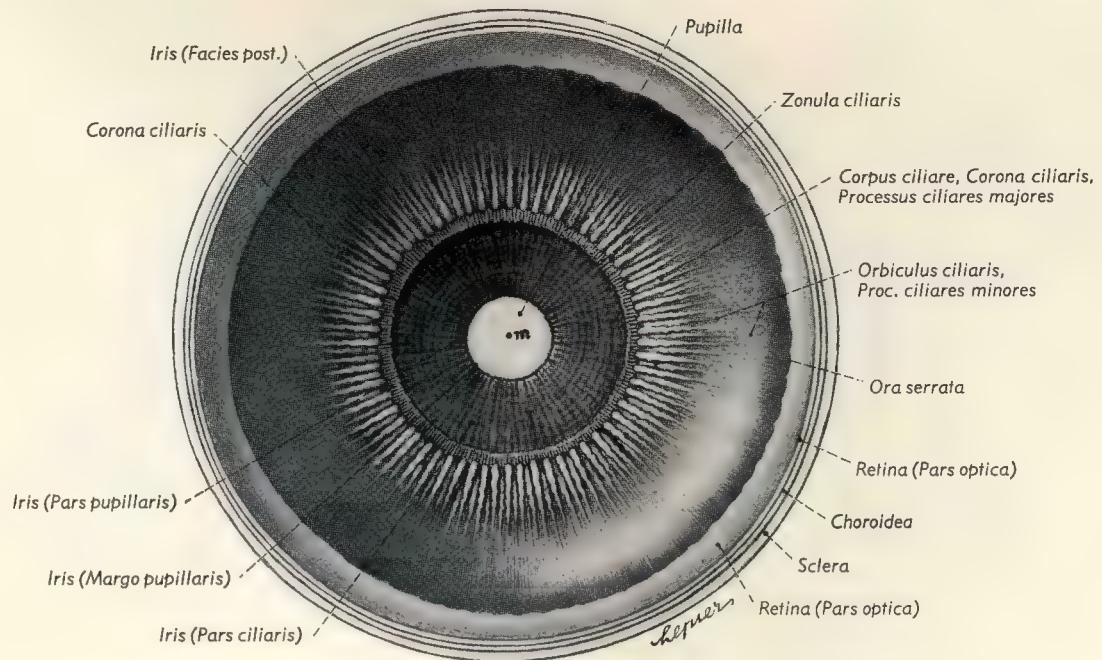
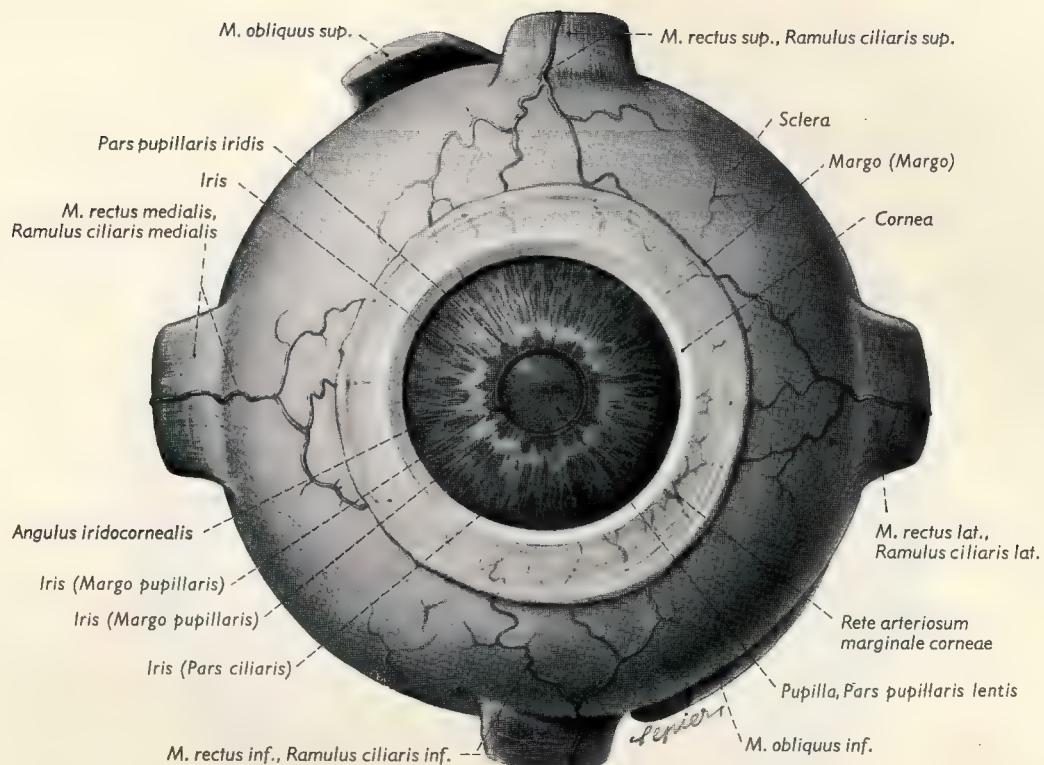
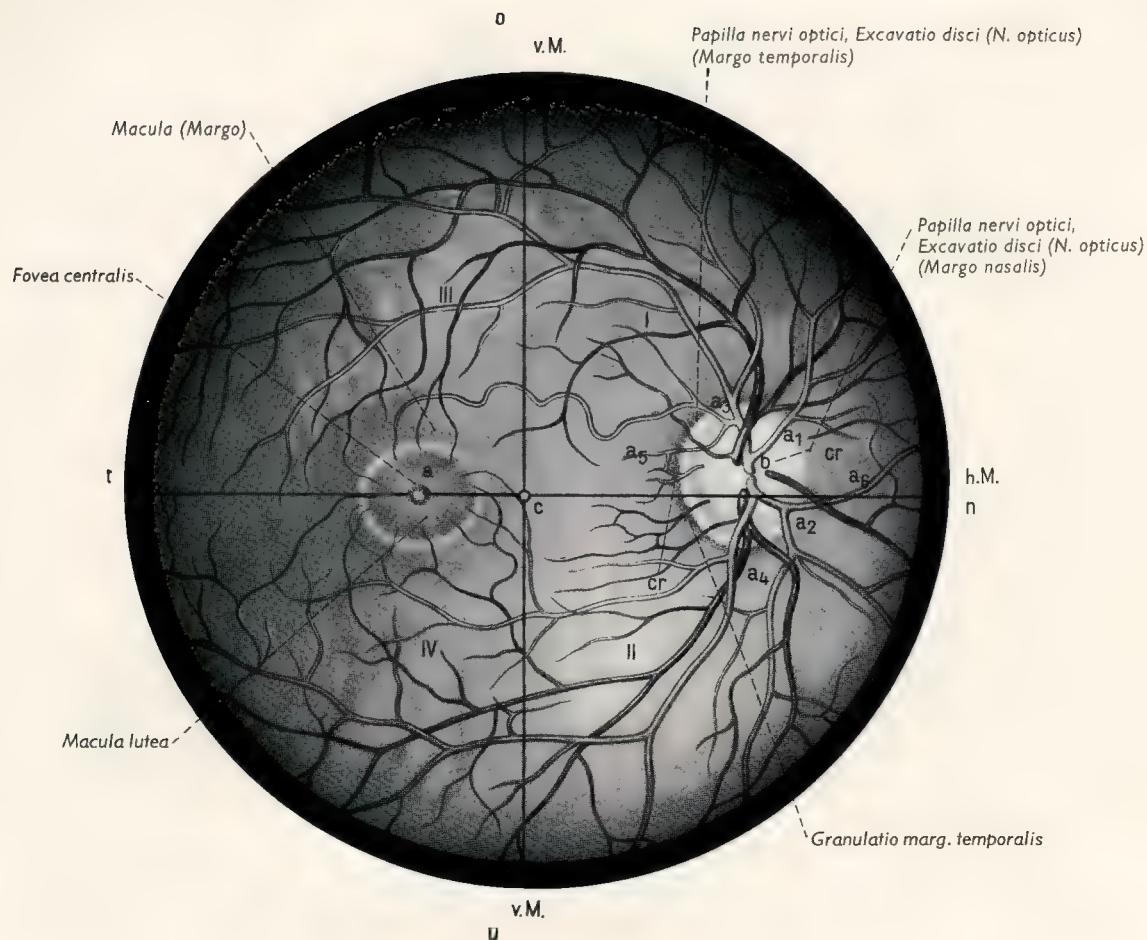


Fig. 226: m = Center of the anterior lens surface
 Fig. 227: m = Center of the posterior corneal surface

Fig. 226. (Top) Ocular bulb from front. The cornea of the left bulb was incised circularly near the corneal edge and removed; the anterior chamber of the eye was opened, and the iris was exposed.

Fig. 227. (Bottom) Anterior portion of the bulb seen from the inside.



a = Fovea centralis
 a₁ = Arteriola nasalis retinae sup.
 a₂ = Arteriola nasalis retinae inf.
 a₃ = Arteriola temporalis sup.
 a₄ = Arteriola temporalis inf.
 a₅ = Arteriolae maculares
 a₆ = Arteriola medialis retinae
 b = Papilla (Discus) n. optici,
 Excavatio papillae
 c = midpoint of fundus
 (posterior pole of eyeball)

cr = cilioretinal anastomoses
 h.M. = horizontal meridian
 n = nasal aspect of fundus
 o = upper aspect of fundus
 t = temporal aspect of fundus
 u = lower aspect of fundus
 v.M. = vertical meridian
 I = upper nasal quadrant of fundus
 II = lower nasal quadrant of fundus
 III = upper temporal quadrant of fundus
 IV = lower temporal quadrant of fundus

Fig. 228. Fundus of the living eye (ophthalmoscopic view).

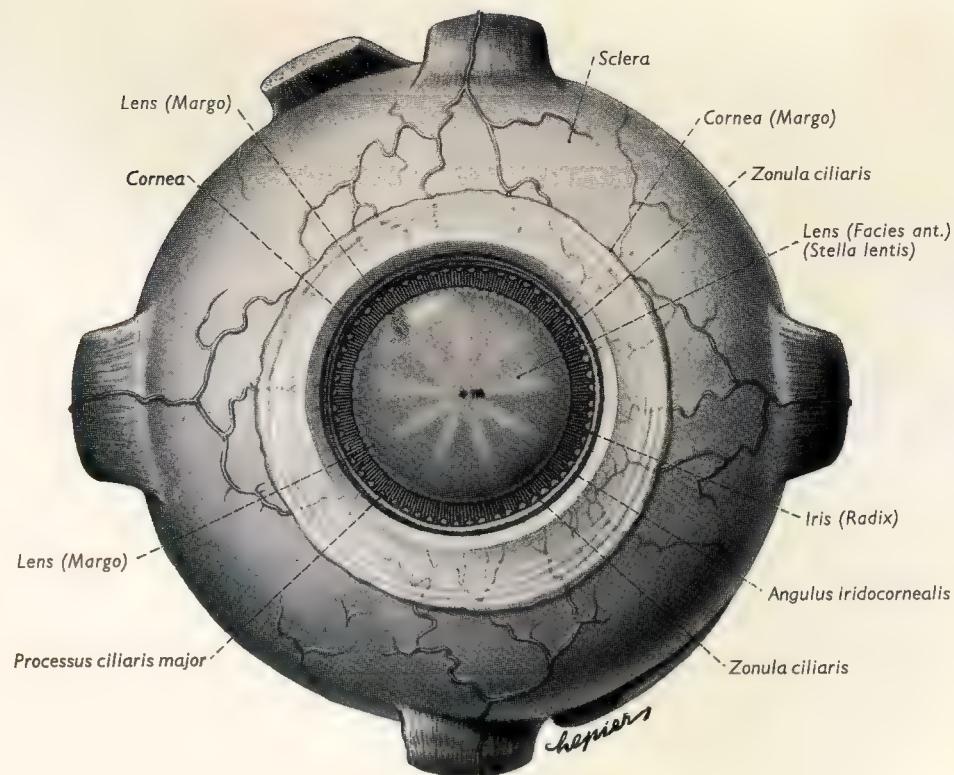
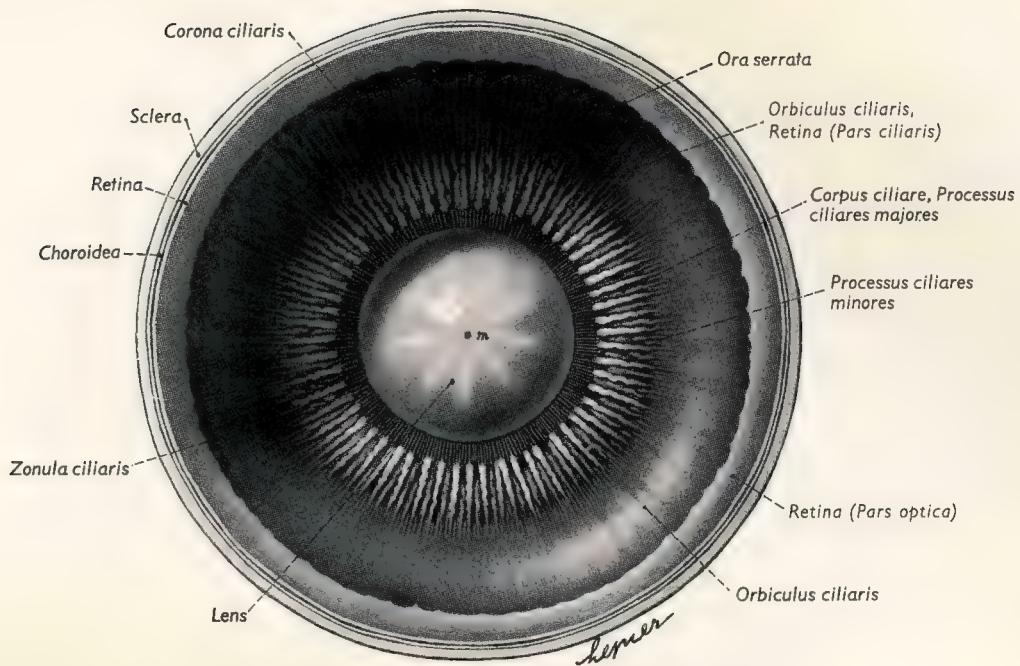
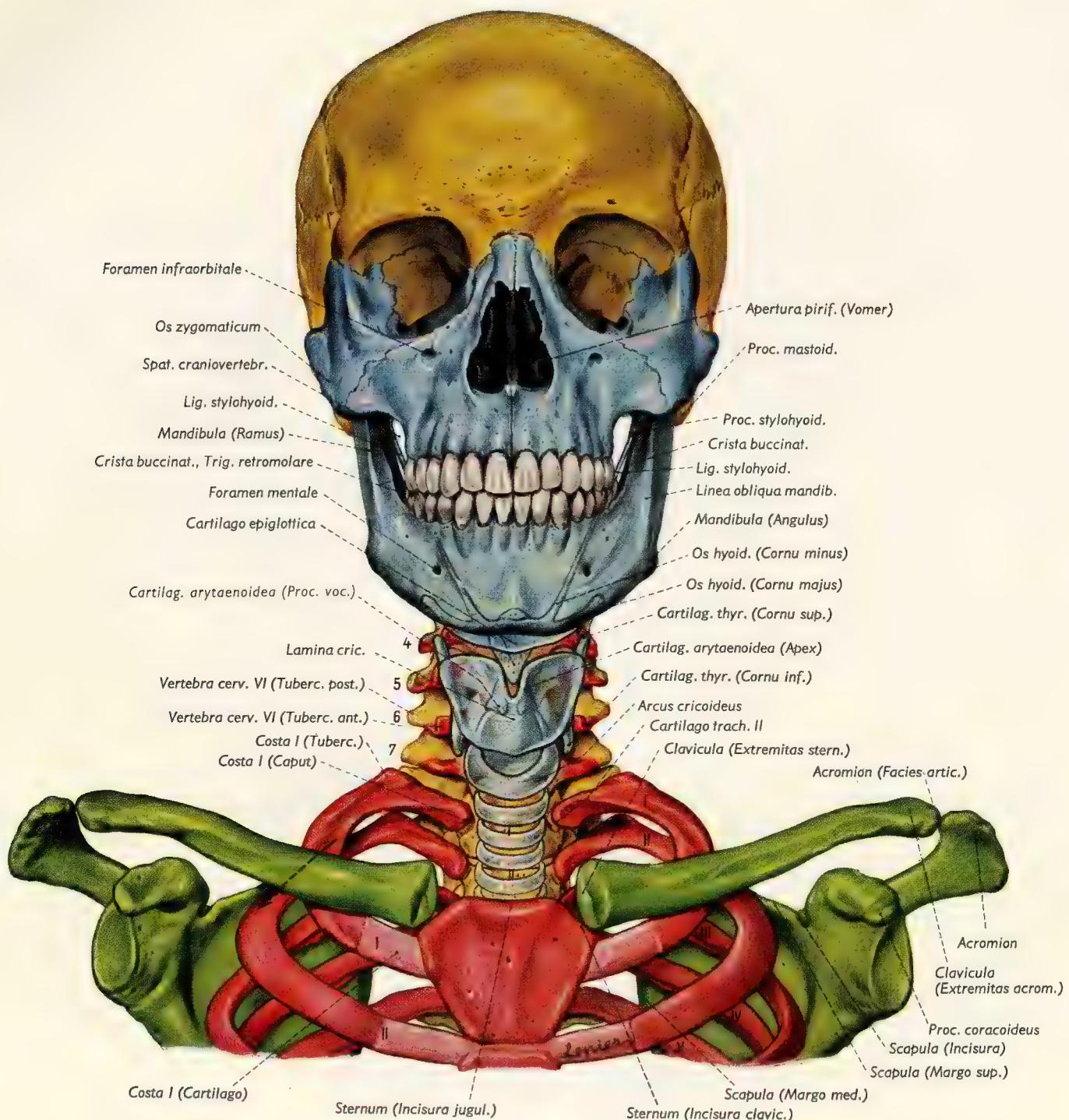


Fig. 229. (Top) View into the anterior half of the eye from behind after removal of the vitreous body.

Fig. 230. (Bottom) Lens and suspensory apparatus from front. On the left bulb the iris was circularly incised near its root and lifted out so as to expose the lens.

The Neck

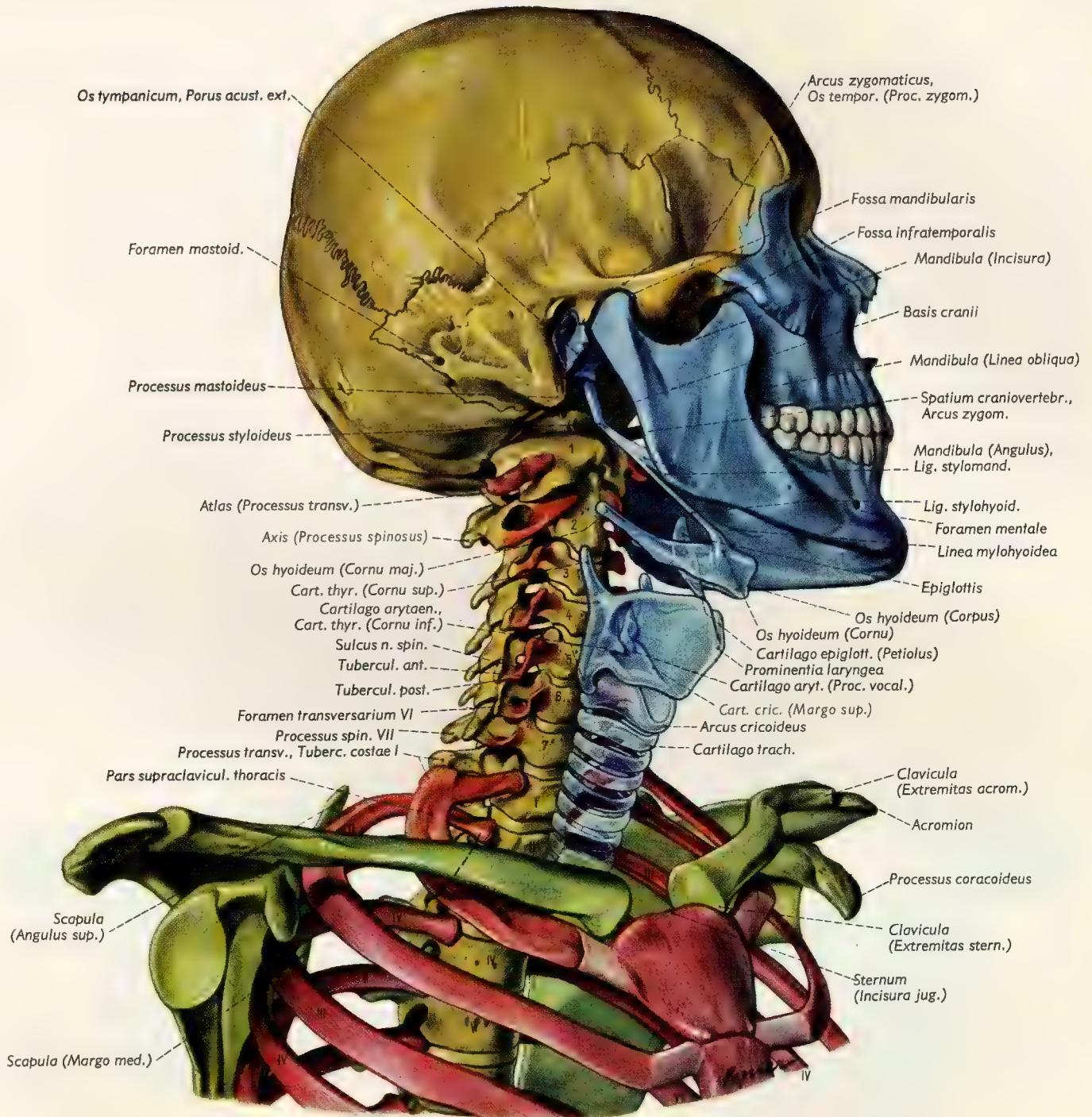
Skeleton, Musculature,
and Visceral Compartments



Blue = visceral cranium and branchial skeletal parts
 Yellow = neurocranium, axial skeleton, bodies, and arches of the cervical vertebrae
 Red = ribs and rudiments of ribs

Green = bones of the shoulder girdle
 4-7 = transverse processes of cervical vertebrae 4-7
 I-V = 1st through 5th ribs and corresponding vertebrae; arrow in costoclavicular space

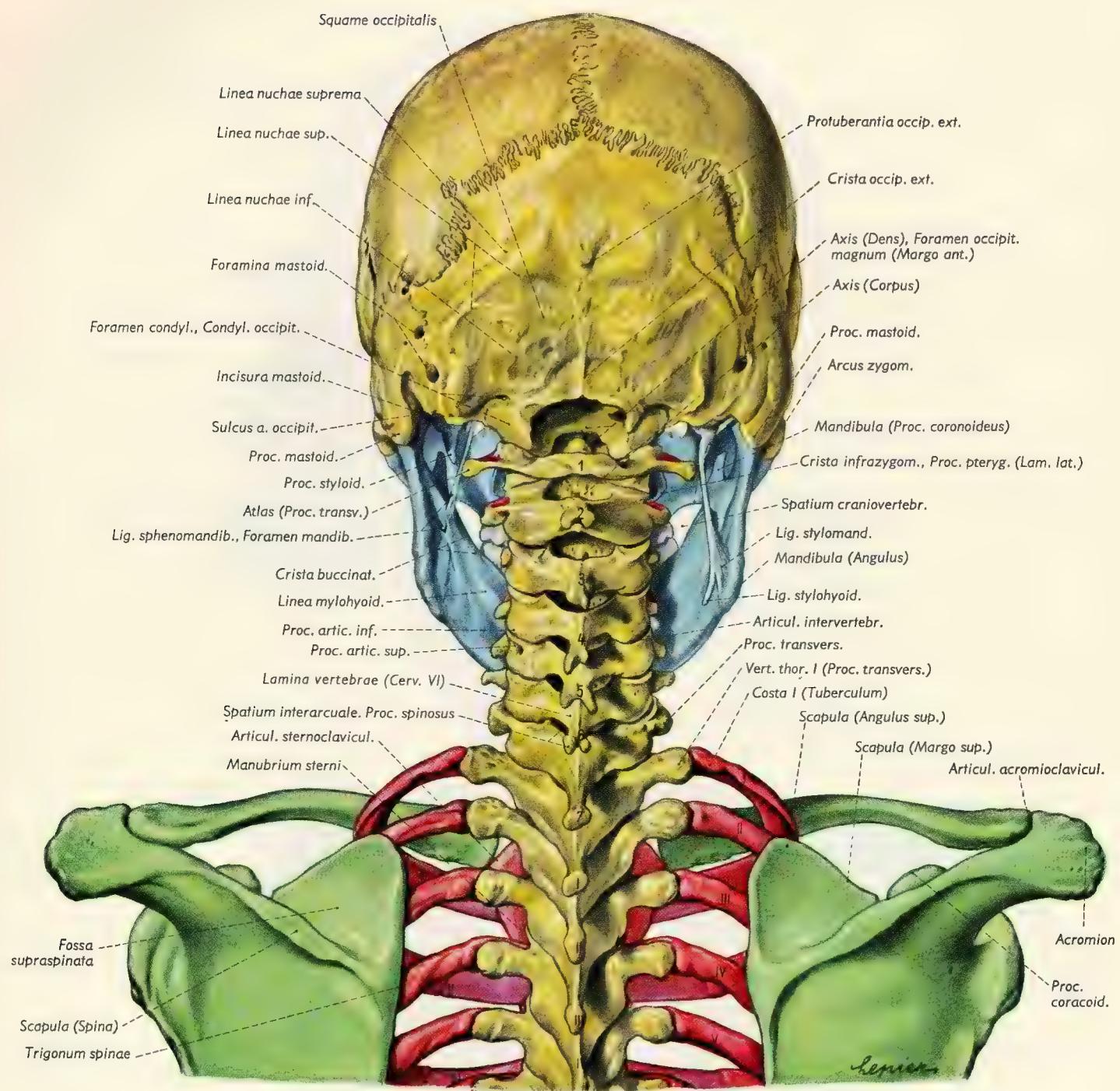
Fig. 231. Skeleton of head and neck seen from front.



Color code as in Fig. 231

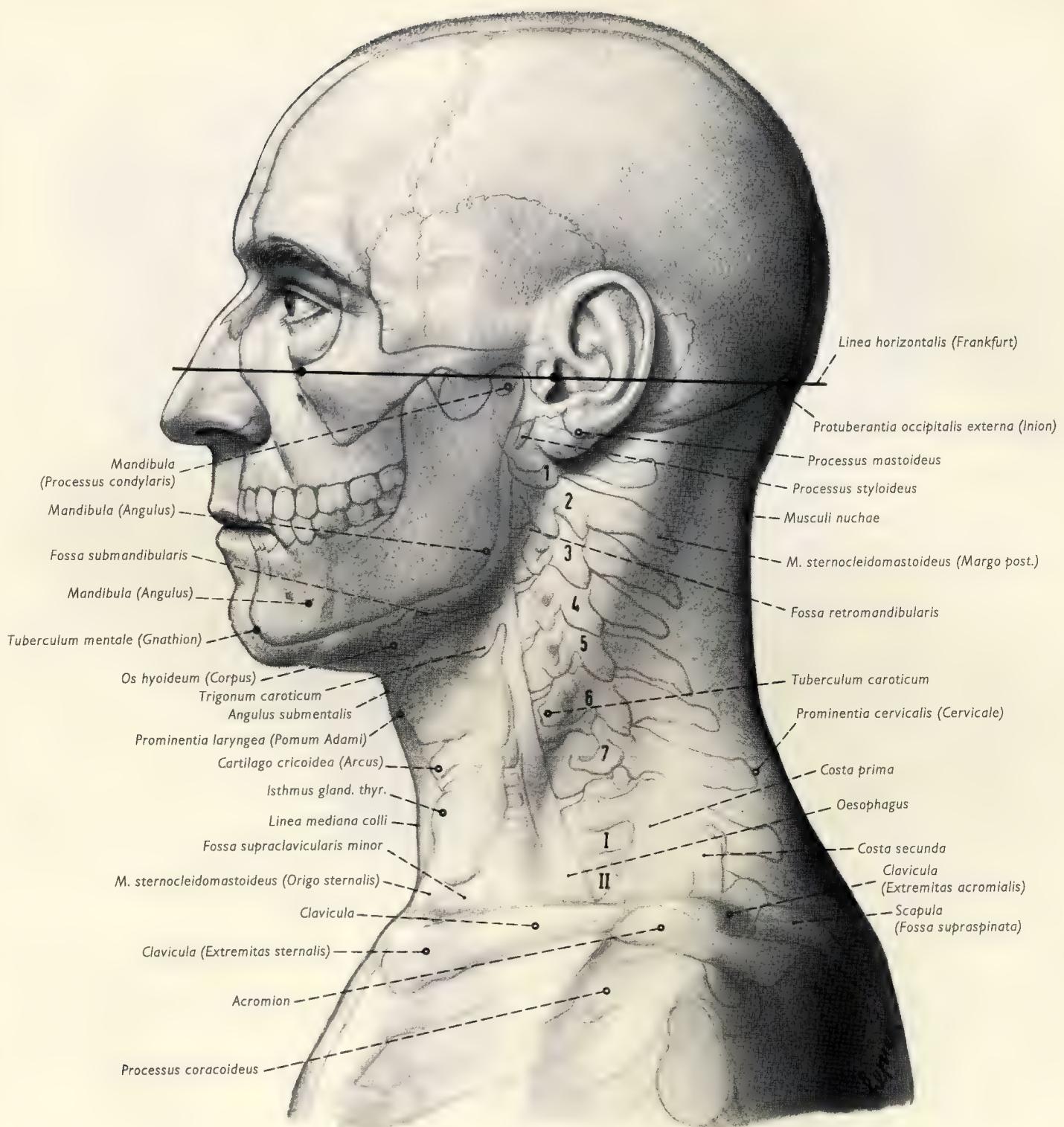
1-7 = bodies of the 7 cervical vertebrae
 1-V = ribs and corresponding thoracic vertebrae;
 arrow in the costoclavicular space

Fig. 232. Skeleton of the head and neck. Viewed from the right side with the head turned slightly to the left.



1–7 = spinous processes of the 7 cervical vertebrae
 I–V = spinous processes of the upper 4 thoracic vertebrae and
 the upper 5 ribs

Fig. 233. Skeleton of the head and neck and the adjoining parts of the thorax. Dorsal view with the head bent slightly forward.



1–7 = cervical vertebrae 1–7
I, II = thoracic vertebrae 1 and 2

Fig. 234. Exterior of neck (viewed from the side with skeletal parts and viscera drawn in). Palpable skeletal landmarks are indicated by o.

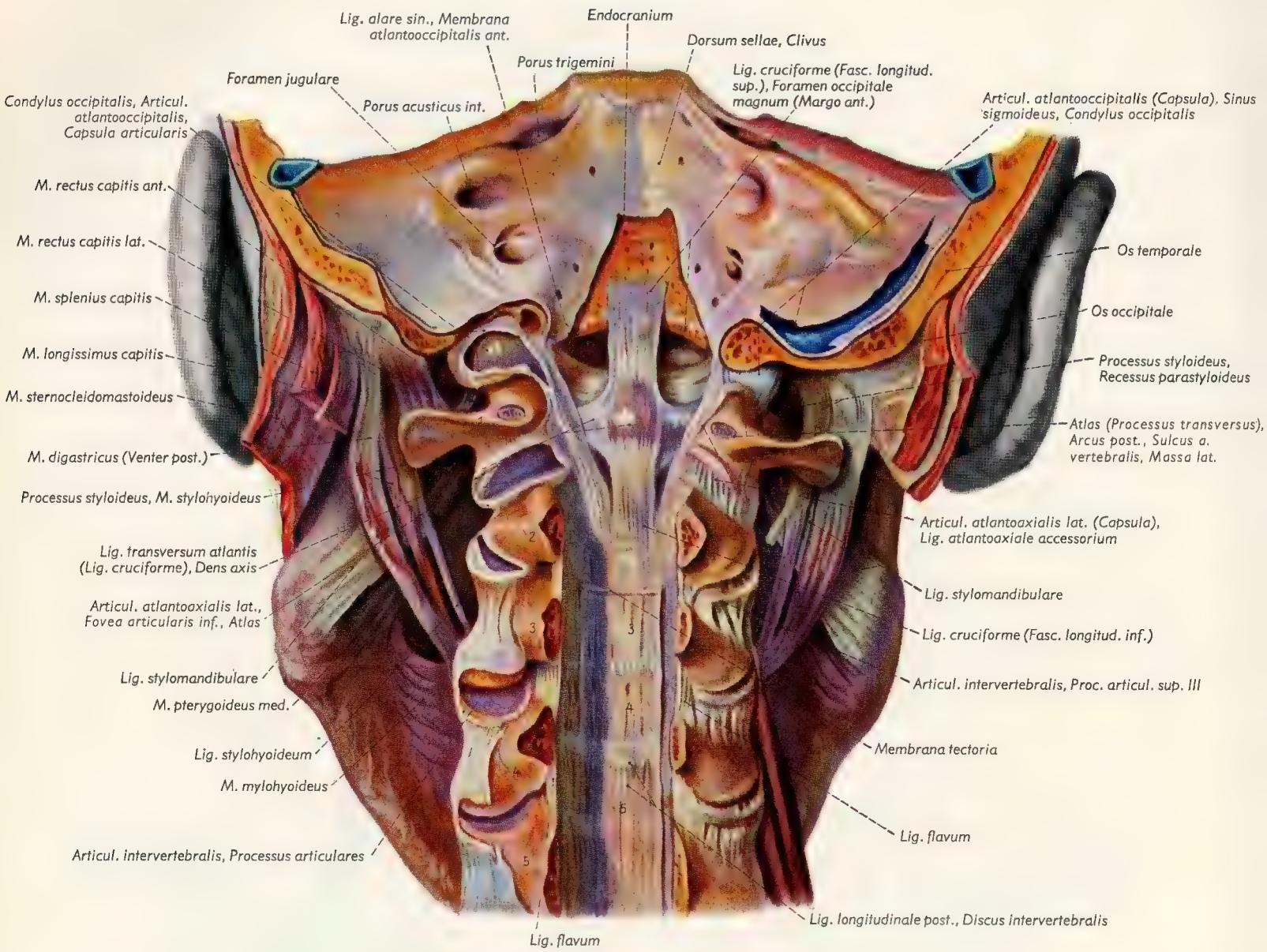


Fig. 235. Dorsal view of the craniocervical joints. The joint capsules are intact on the right side and opened on the left side. The tectorial membrane has been removed from the anterior wall of the vertebral canal so that the proper ligaments of the craniocervical joints (cruciform and alar ligaments) may be seen (drawn by K. Endtresser, 1951).

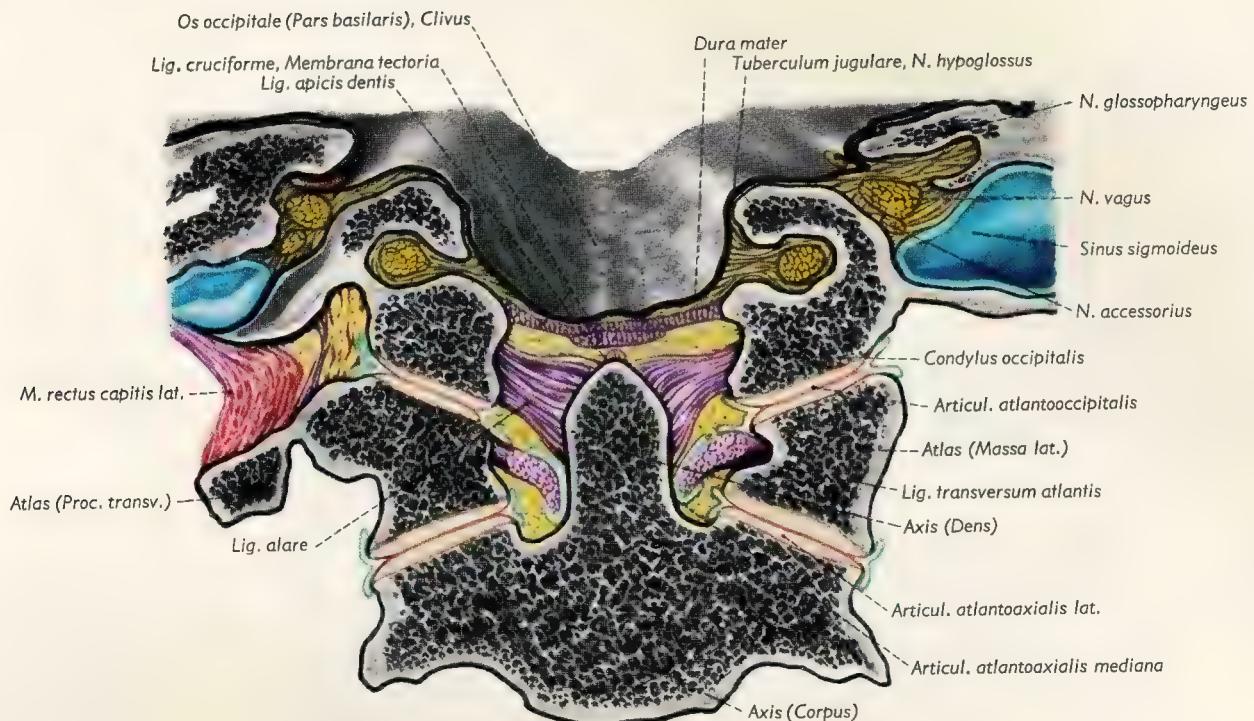


Fig. 236. Frontal section through the region of the craniocervical junction. Dorsal view of the cut surface.

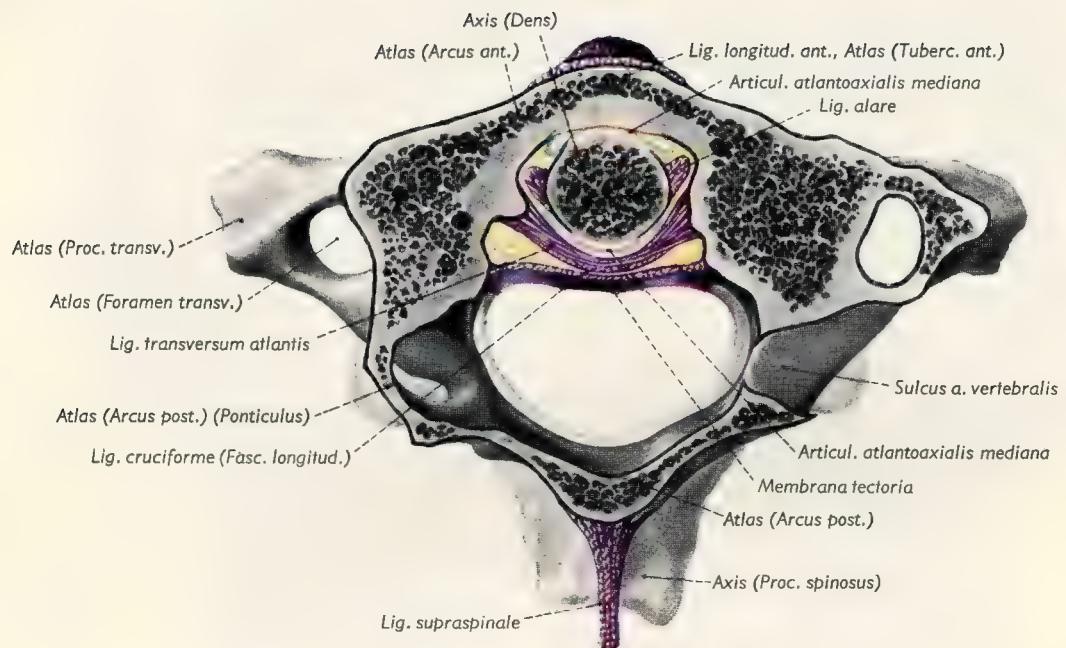
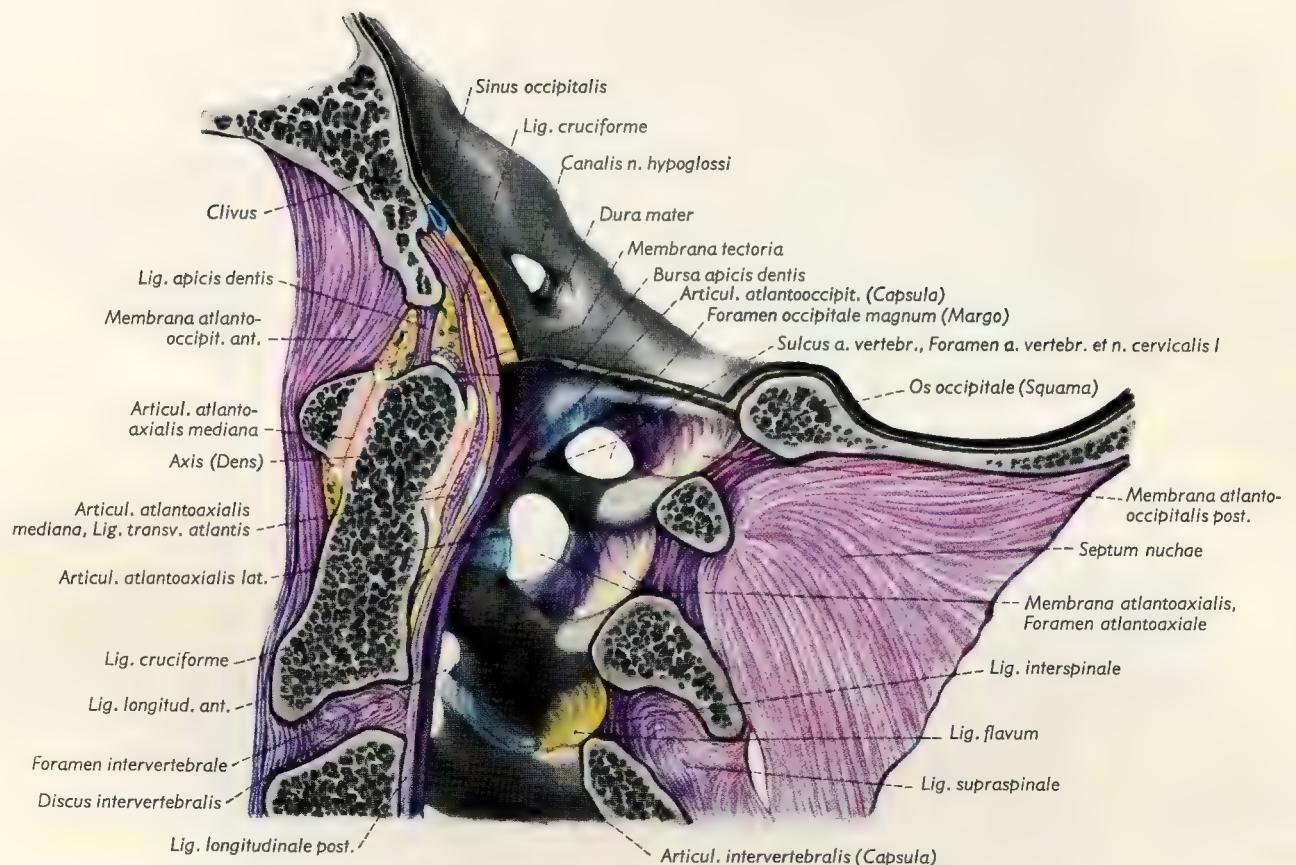


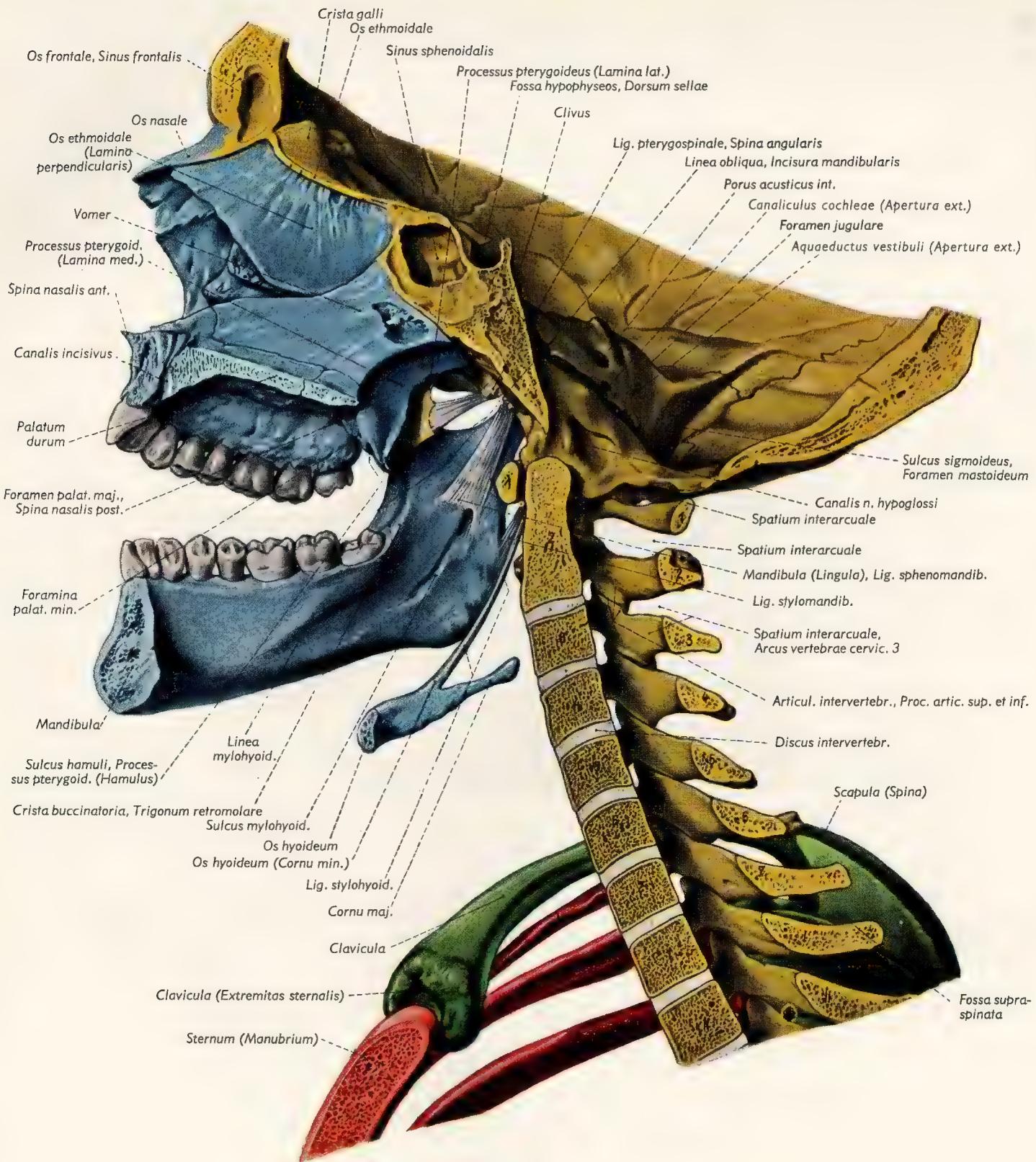
Fig. 237. Transverse section through the region of the craniocervical joints at the level of atlas (viewed from above).



Violet = ligaments
 Light blue = synovial membranes of joint capsules and cavities

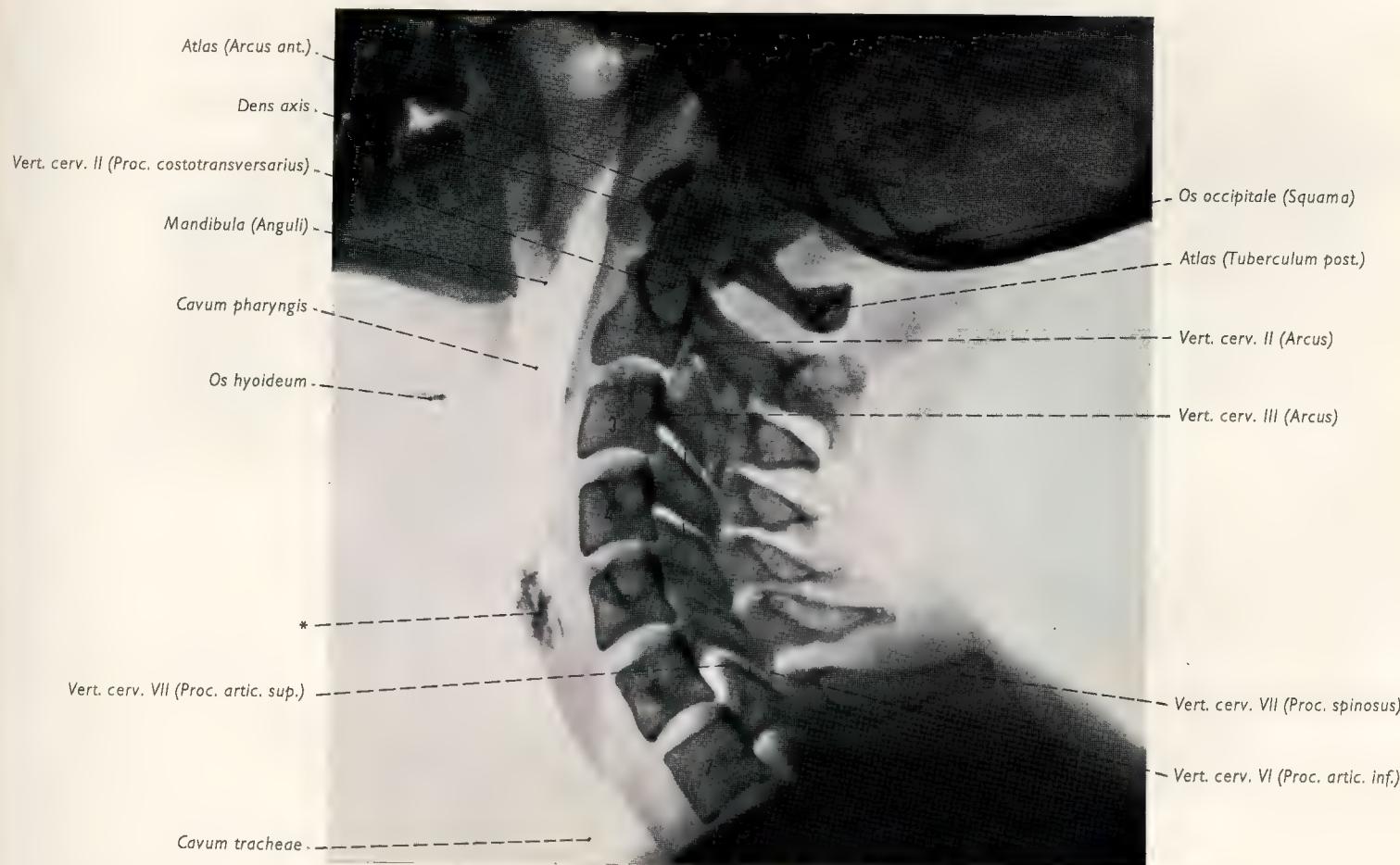
Dark blue = surfaces of joint capsules
 Brown = articular cartilage
 Yellow = flaval ligaments

Fig. 238. Midsagittal section through the region of the cranovertebral joints (right half).



1–7 = bodies and spinous processes of cervical
vertebrae 1–7
I–III = ribs and associated thoracic vertebrae

Fig. 239. Median section of head and neck skeleton.



1 = atlas

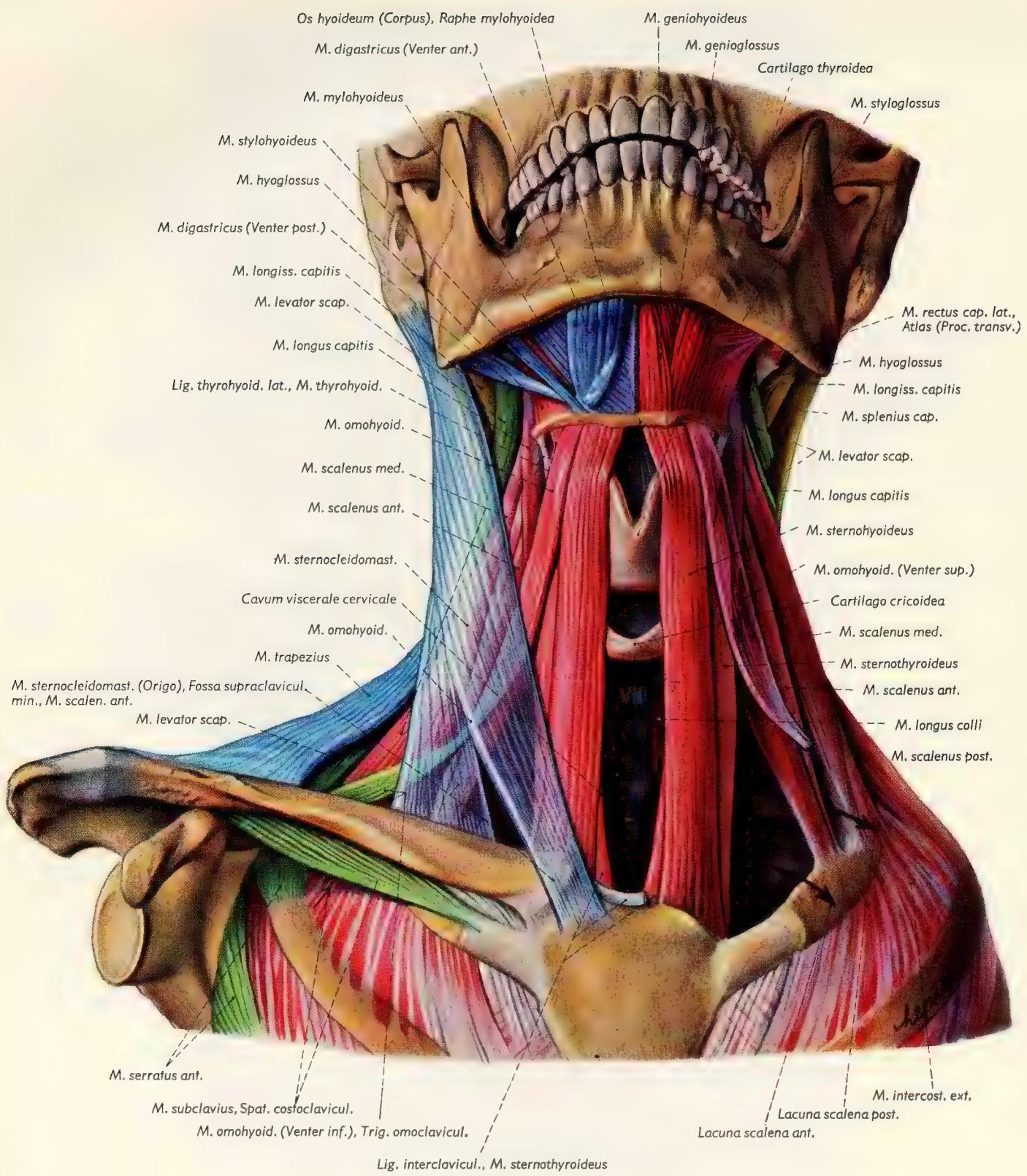
2-7 = bodies of cervical vertebrae

i = intervertebral joints

* = Cartilago cricoidea

Fig. 240. (Top) Roentgenogram of cranial end of cervical vertebral column, anteroposterior view through mouth (L. Wicke, Vienna).

Fig. 241. (Bottom) Roentgenogram of adult cervical vertebral column, lateral view, head in normal, standing posture (L. Wicke, Vienna).

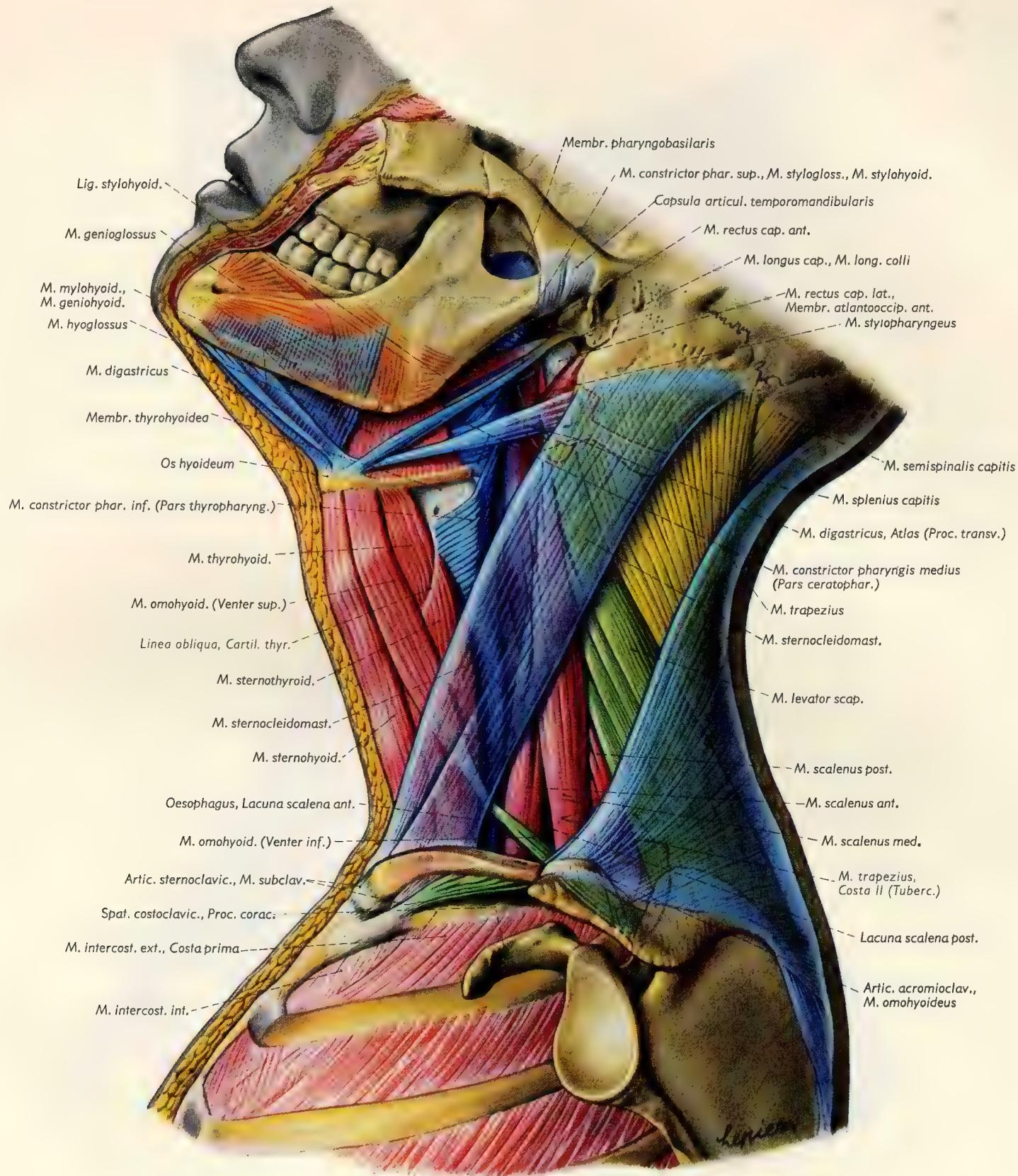


Blue = branchial musculature
Green = muscles of shoulder girdle

Red = ventrolateral (somatic)
musculature of neck

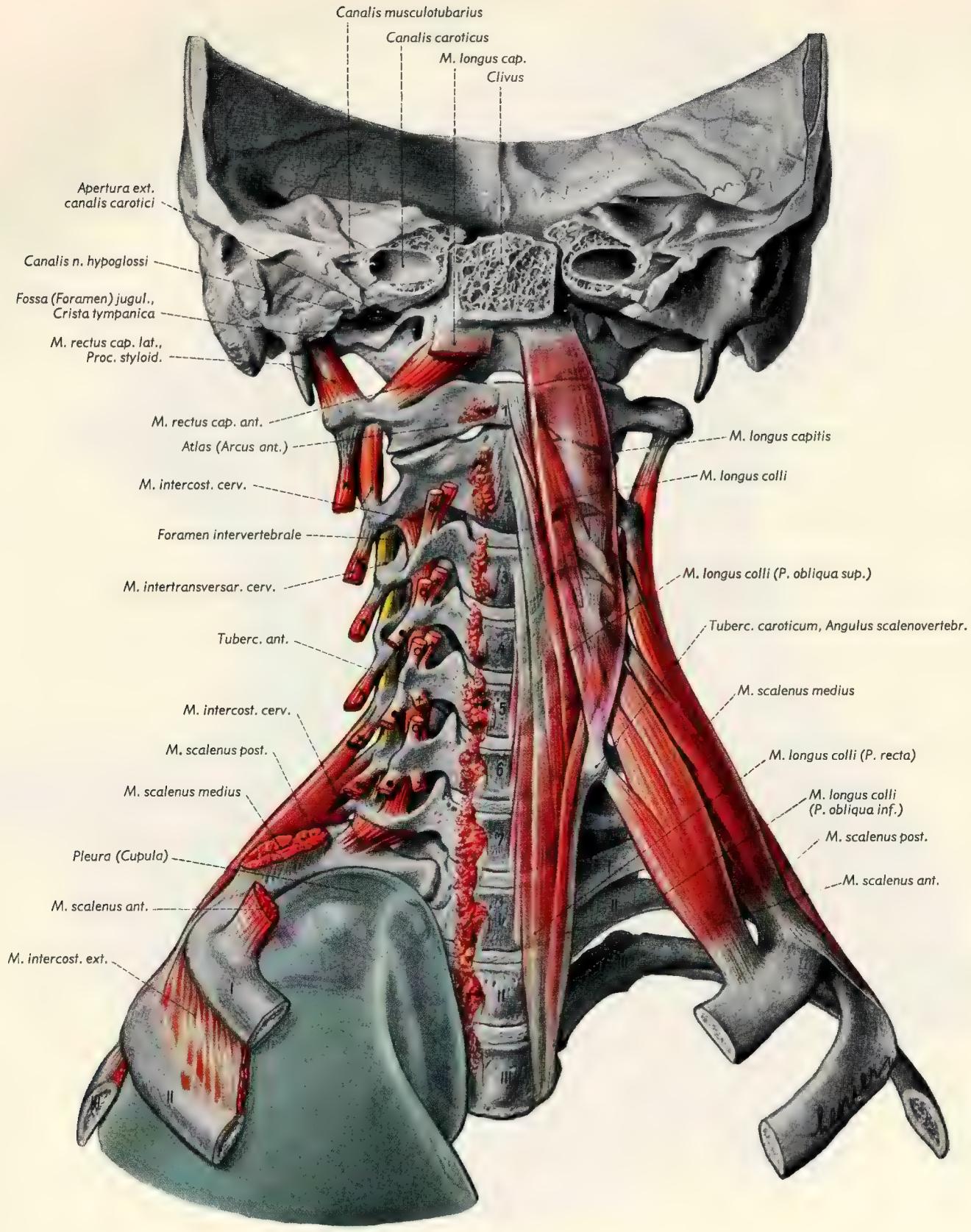
Yellow = somatic, dorsal (back)
musculature = intrinsic
muscles of post. neck region
VII = 7th cervical vertebra

Fig. 242. Musculature of the neck. Front view (neurovascular bundles and viscera removed). The left shoulder girdle and associated muscles have been resected so that the suprathyroid tongue musculature and the infrathyroid ventrolateral neck muscles and scalene lacunae (anterior and posterior, arrows) may be seen.



Color code as in Fig. 242
Brown line = outline of atlas

Fig. 243. Neck musculature seen from the left side; head bent backward.



Red = ventrolateral neck musculature

Yellow = dorsal musculature

1-7 = cervical vertebrae 1-7

I-III = thoracic vertebrae 1-3 and corresponding ribs

+ • = slips of attachments of the longus colli m. on the bodies of the vertebrae

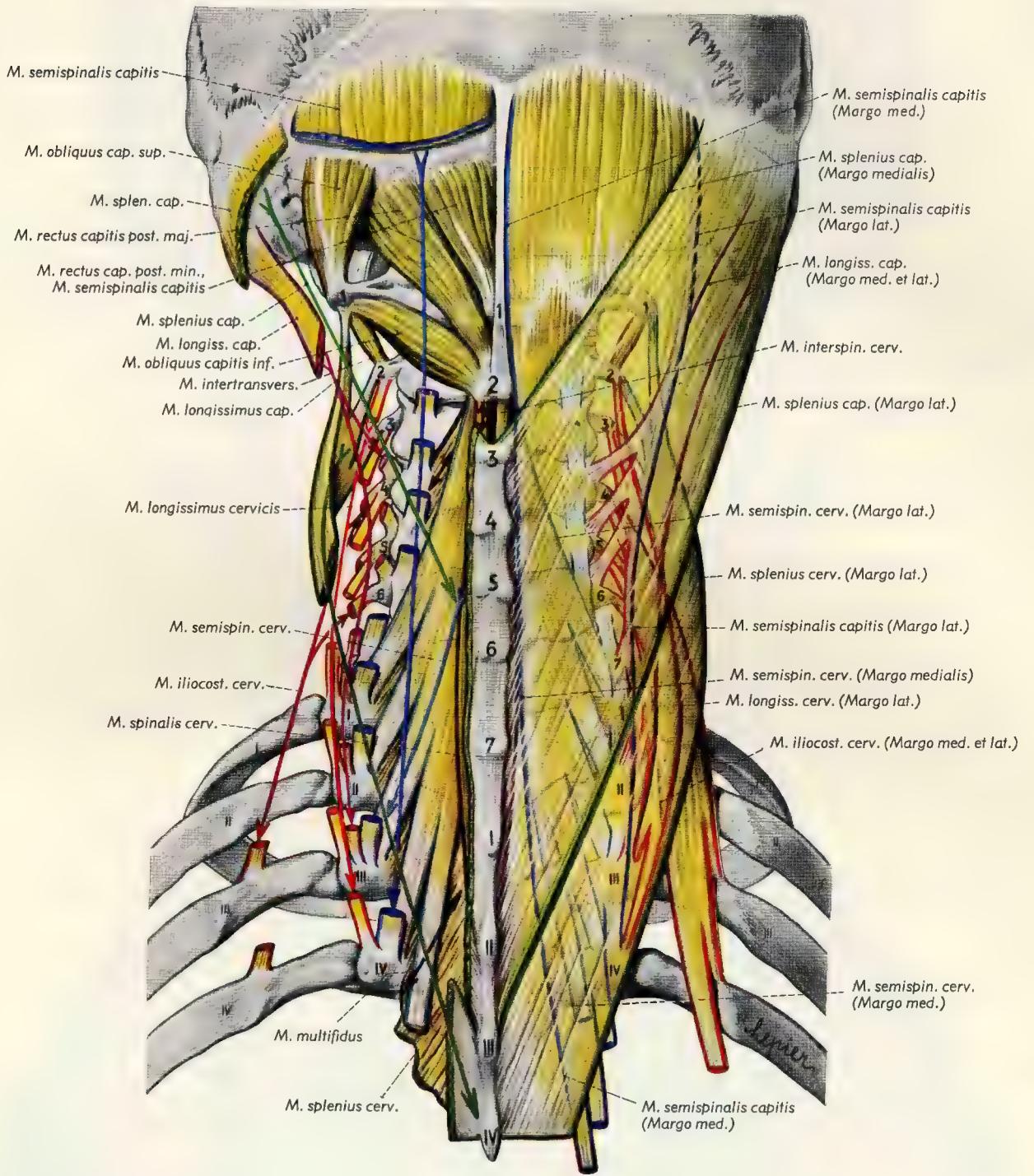
+ = slips of attachments of the oblique parts of longus colli m. on the transv. proc. (ant. tubercle)

O = slips of origin of longus capitis m. on the transv. proc. (ant. tubercle)

• = slips of origin of the anterior scalene m. on the transv. proc. (ant. tubercle)

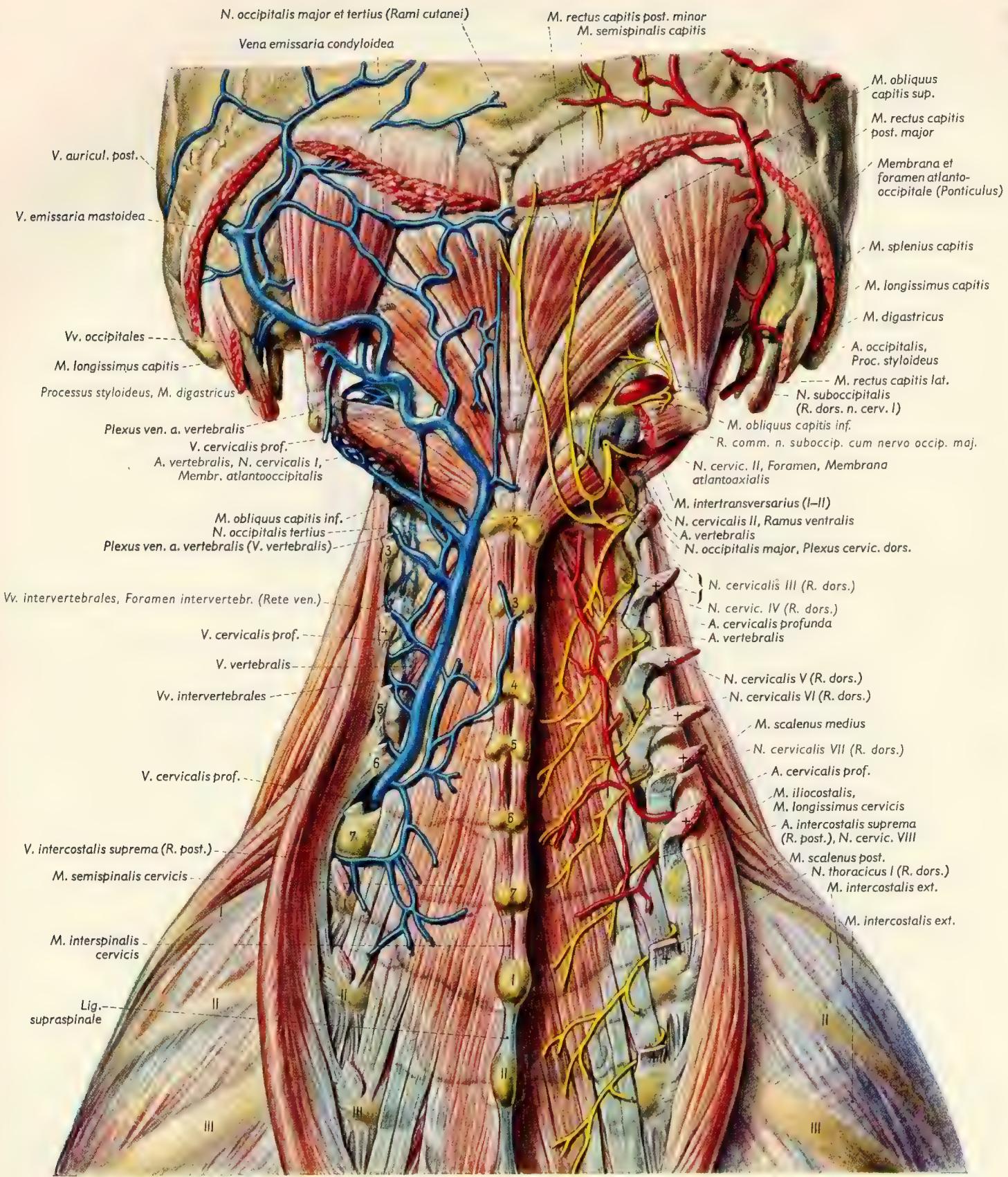
x = slips of origin of the middle scalene m. on the transv. process (post. tubercle)

Fig. 244. Prevertebral and paravertebral neck musculature. The left longus capitis muscle has been drawn transparent; on the right side the muscles have been removed from their sites of attachment so that the smaller cervical intercostal and intertransverse muscles may be seen. The cupula of the right pleura is retained.



I-IV = spinous and transverse processes of thoracic vertebrae 1-4 and corresponding ribs
 1-7 = spinous and transverse processes of cervical vertebrae 1-7

Fig. 245. The intrinsic muscles of posterior neck region (schematic, seen from behind) toned yellow and outlined in different colors. The superficial muscles on the right side are drawn transparent; on the left side only the origins and/or the insertions are indicated in order to bring into view the underlying muscles. The directions of pull of the muscles on the left side are indicated by arrows in appropriate colors.



+ = slips of origin of semispinalis capitis

1-7 = spinous and transverse processes
(post. tubercles)
of the 7 cervical vertebrae

I-II (III) = spinous processes of thoracic
vertebrae 1-3
and corresponding ribs

Fig. 246. The deep muscles, blood vessels, and nerves of the back of the neck. Arteries and nerves are shown on the right, nerves on the left. The shoulder girdle and associated musculature, the splenius, semispinalis capitis, and longissimus cervicis have been removed.

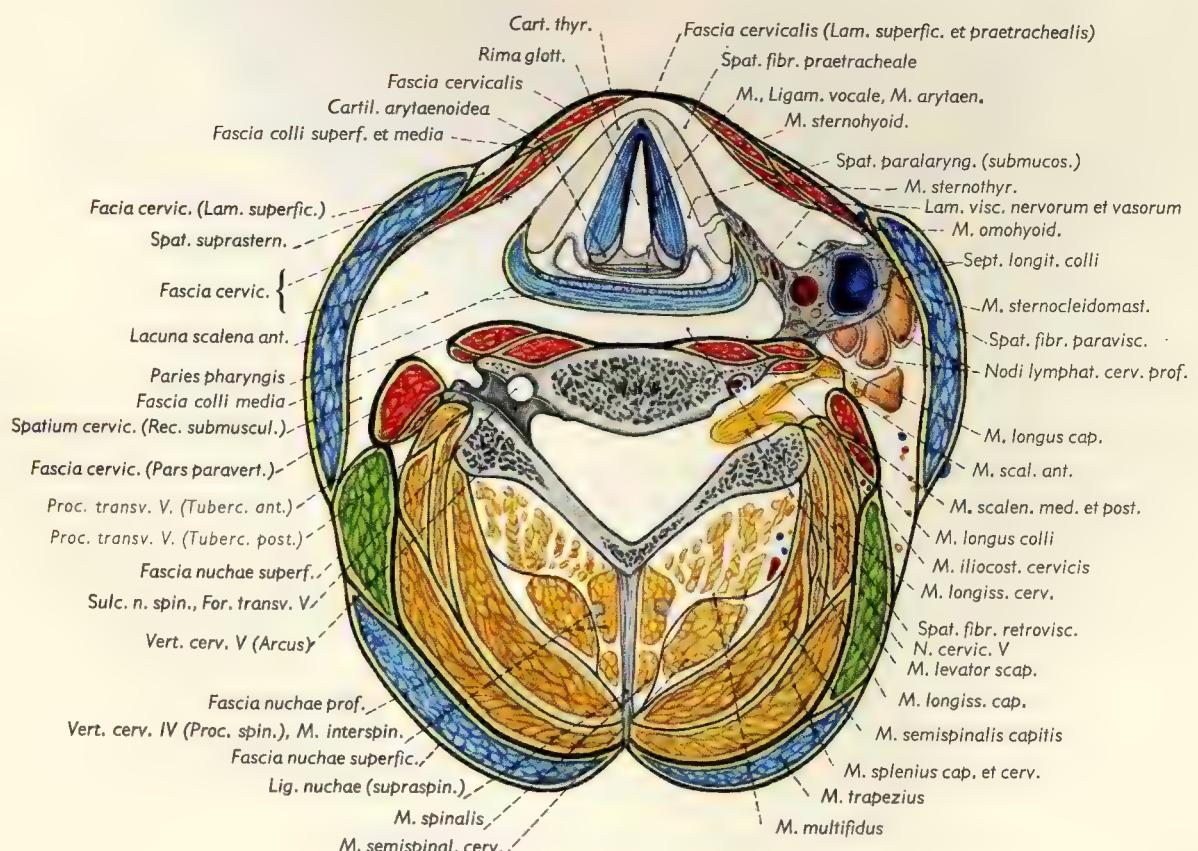
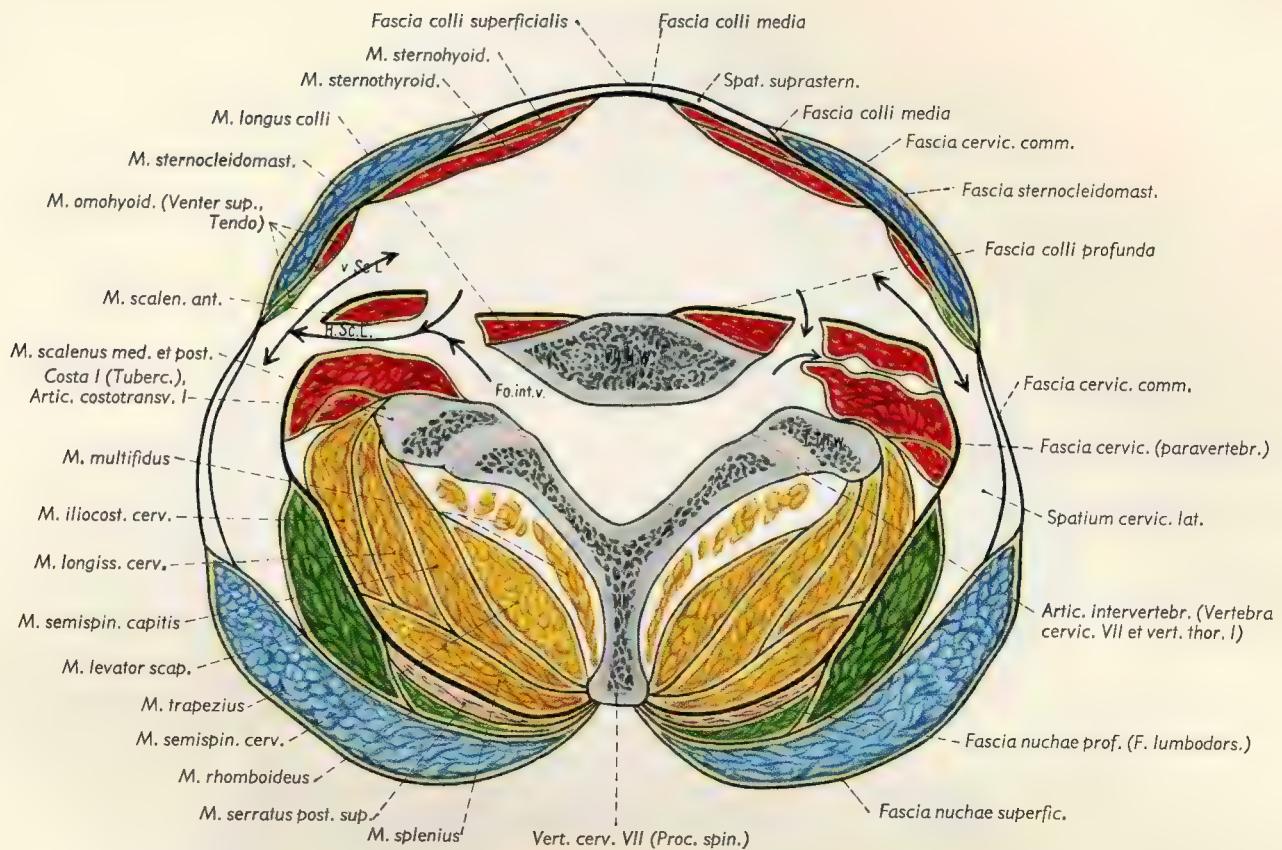
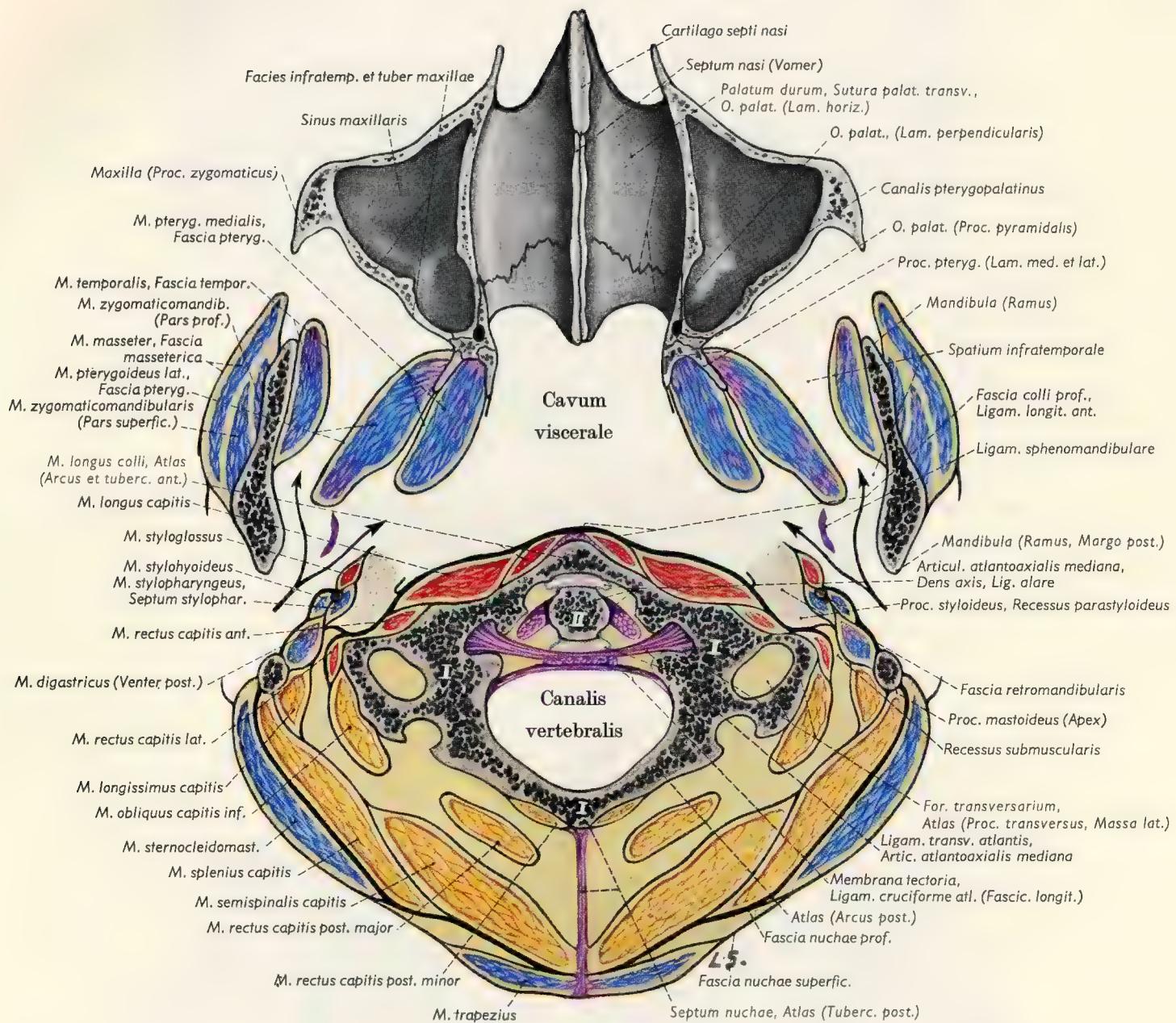


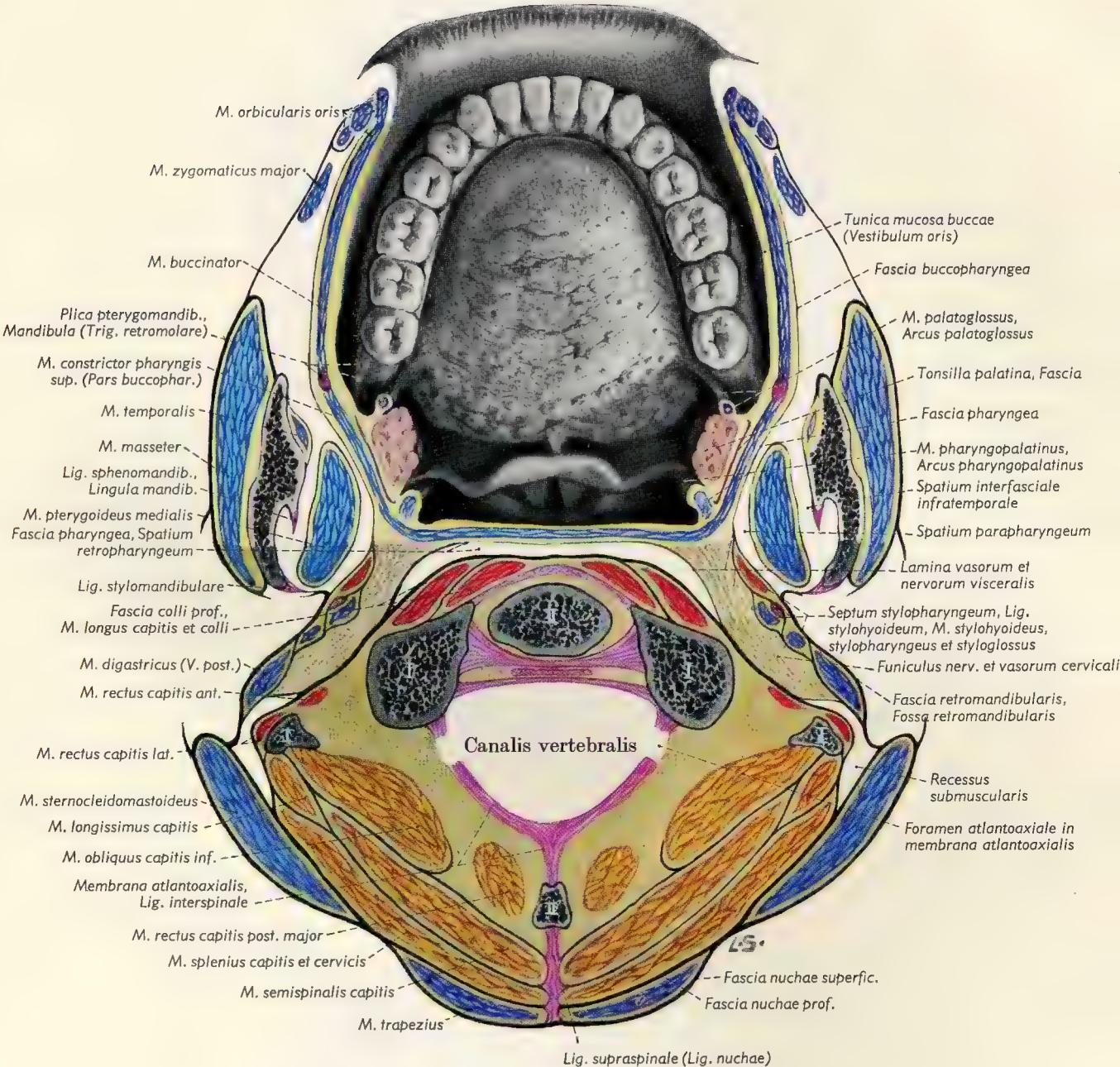
Fig. 247. (Top) Cross section through the neck at the level of the 7th cervical vertebra (bones, muscles, and fasciae).

Fig. 248. (Bottom) Cross section through the neck at the level of the 5th cervical vertebra (bones, muscles, and fasciae).



I = Atlas
II = Dens axis

Fig. 249. Cross section through the neck at the level of the atlas, and through the facial skeleton immediately above the floor of the nasal cavity. Viewed from above, showing skeletal parts, muscles, ligaments, and fasciae. Arrows: entrance from the retromandibular fossa, in front of the styloid process, into the craniovertebral space, or rostrally into the infratemporal space.



I = Massa lateralis, Proc. transv. atlantis
 II = Dens and proc. spinosus axis

Fig. 250. Cross section through the head and neck region at the level of the dens of the axis, oropharynx, and the occlusal plane showing skeletal parts, muscles, ligaments, and fasciae. Paravisceral and retrovisceral compartments are white. The infratemporal (interfascial) fossa and the submuscular recess of the lateral fascial compartments of the neck are empty. Not included in the drawing are the buccal fat pad, the contents of the fascially enclosed retromandibular fossa (parotid gland), the structures in the illustrated neurovascular sheath (stylopharyngeal septum), and the neurovascular bundle that occupies the parasyloid recess.

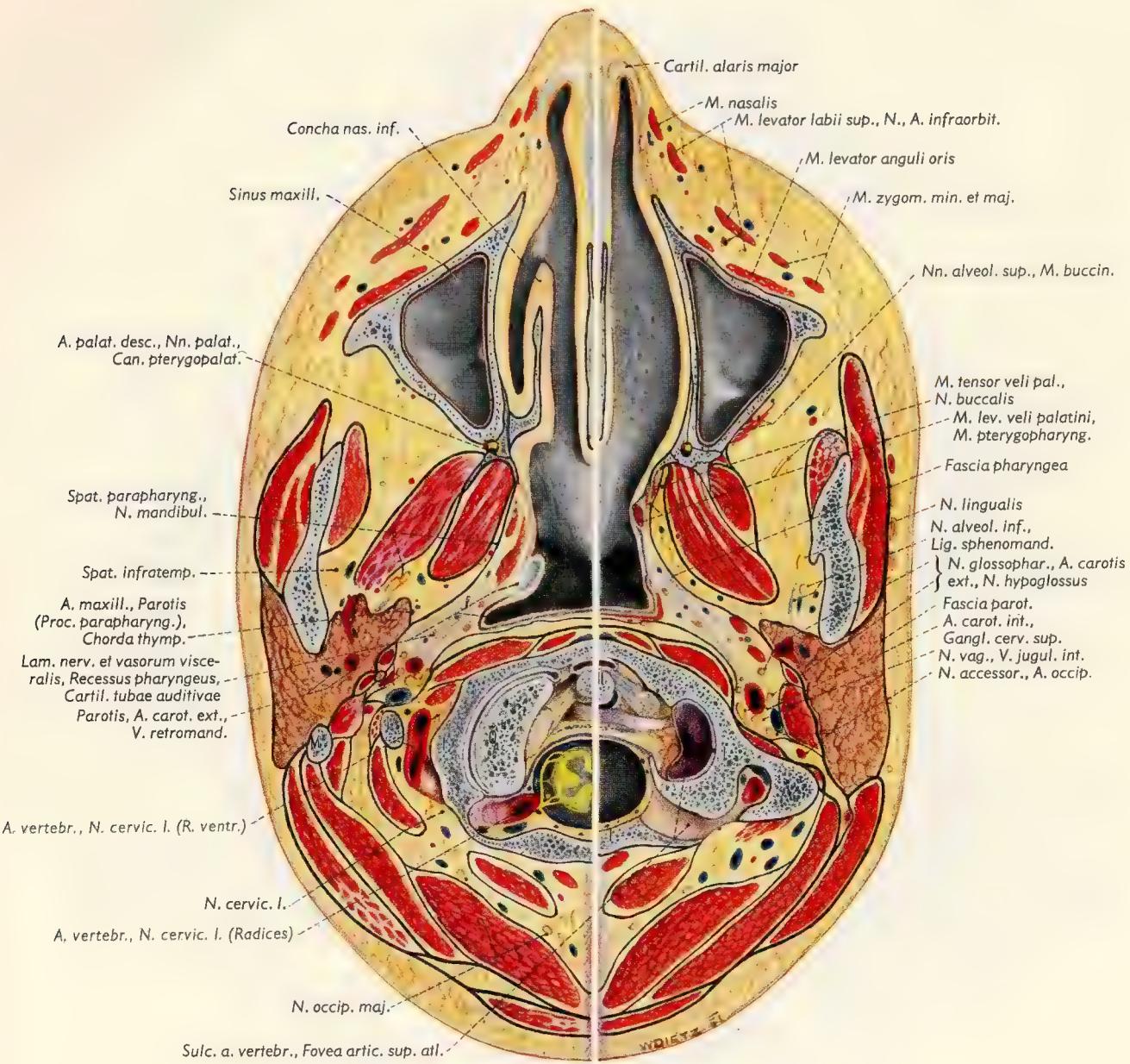


Fig. 251. Cross section through the head and neck region at the level of the nasopharynx (on the right side the cut was made somewhat more inferior). View of the floor of the nasal cavity and the maxillary sinus. Note the anterior extension of the parotid gland toward the parapharyngeal space.

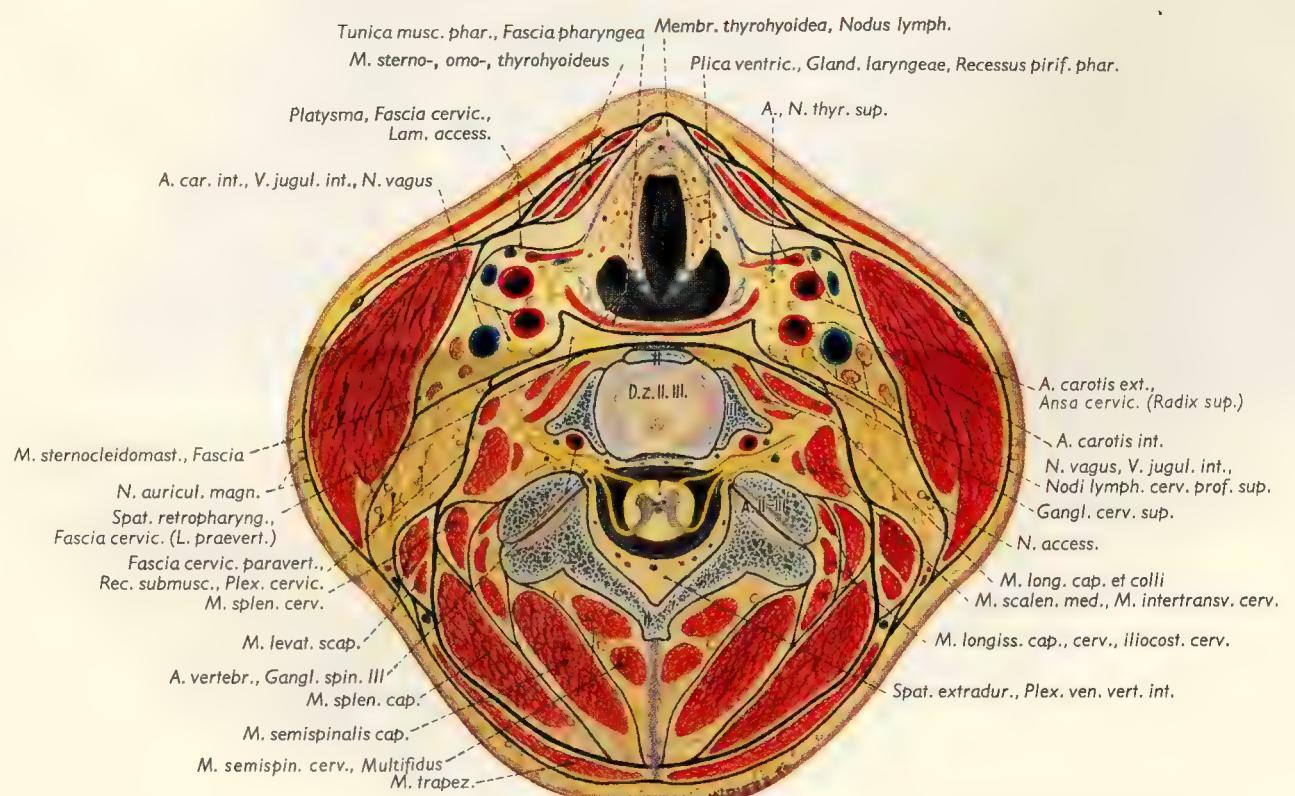
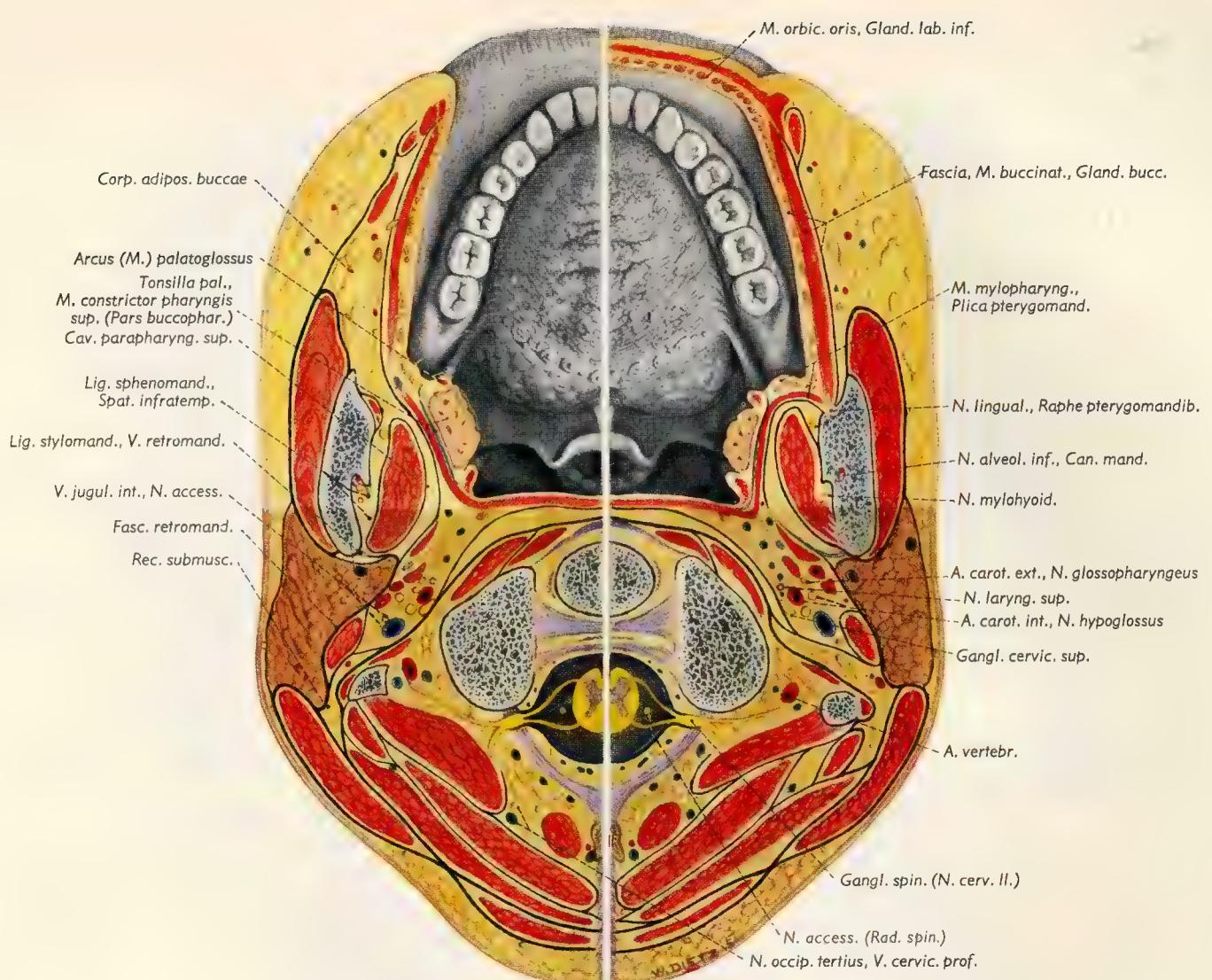


Fig. 252. (Top) Cross section through the head and neck region at the level of the oropharynx.

Fig. 253. (Bottom) Cross section of the neck through the glottis and the 2nd and 3rd cervical vertebrae.

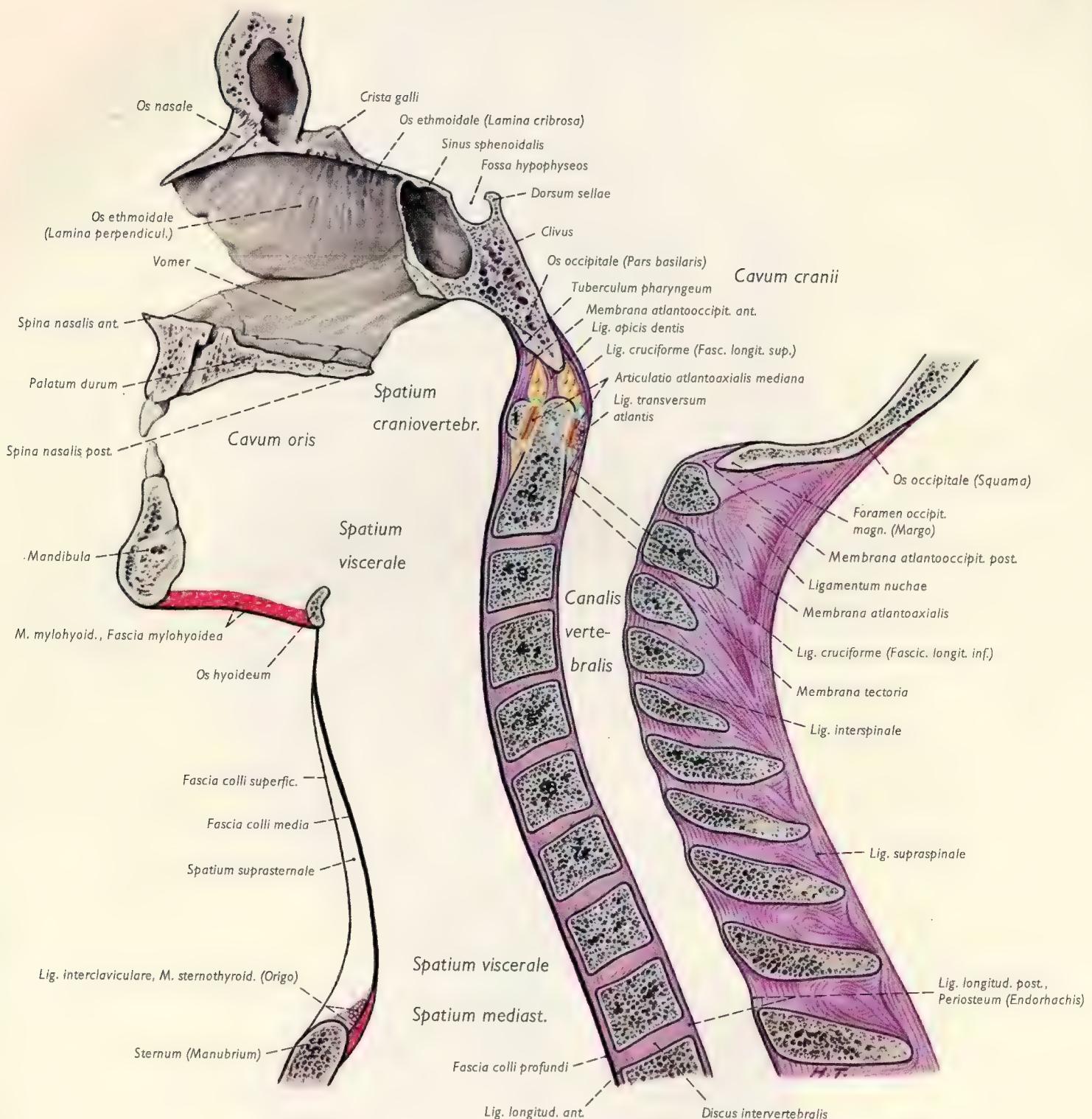


Fig. 254. Median section through the bony and fascial boundaries of the visceral and neural compartments of the neck. The visceral compartment of the neck, the adjoining craniovertebral space, the oral cavity above, the thoracic cavity below, and the vertebral canal are empty.

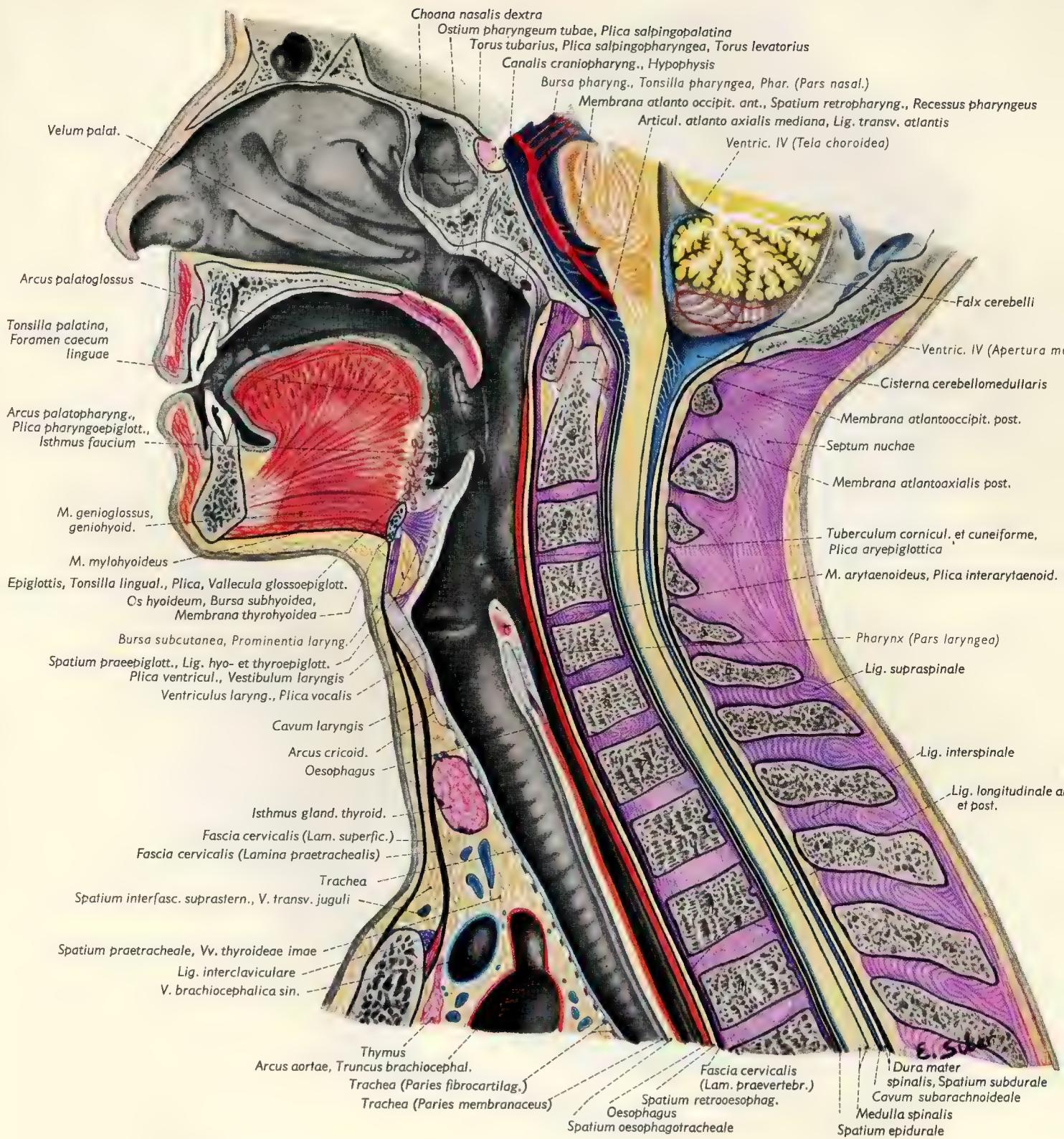
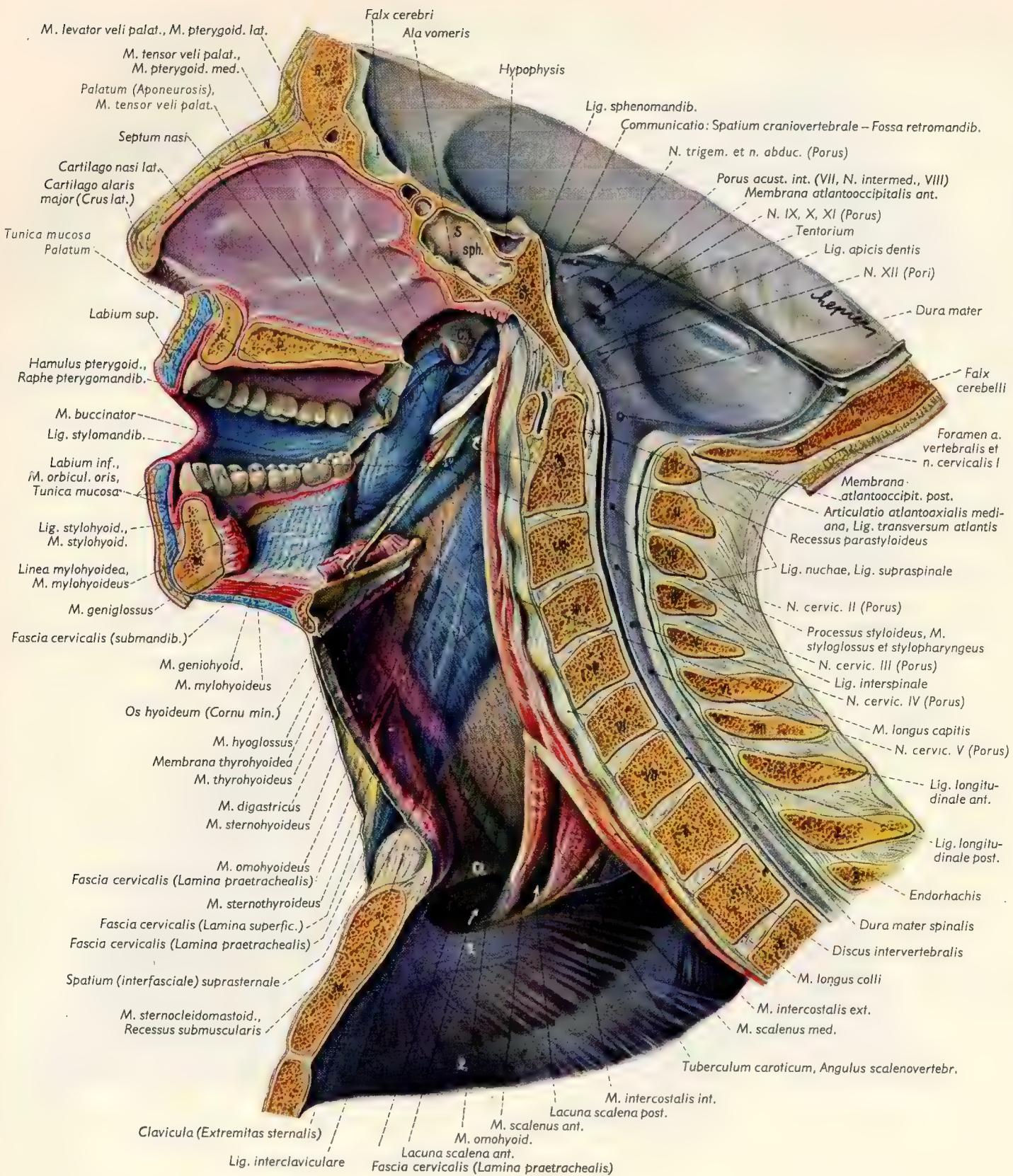


Fig. 255. Median section through the neck and adjoining head and thoracic regions with the contents of the fascial compartments (previsceral space, etc.); right half of the section.



C.t = Cartilago tubae
 Cl = Clavica
 F = Squama ossis frontalis
 H = Os hyoideum
 M = Mandibula, Manubrium sterni
 N = Os nasale

O = Os occipitale
 P = Palatum durum
 S.sph = Sinus sphenoidalis
 I-VII = Vertebrae cervicales
 1-3 = Vertebrae thoracicae
 1.,2. = 1st and 2nd ribs
 Arrows = scalene lacunae

Fig. 256. Neck musculature of the right side seen from the medial aspect after removal of all viscera and neurovascular bundles.

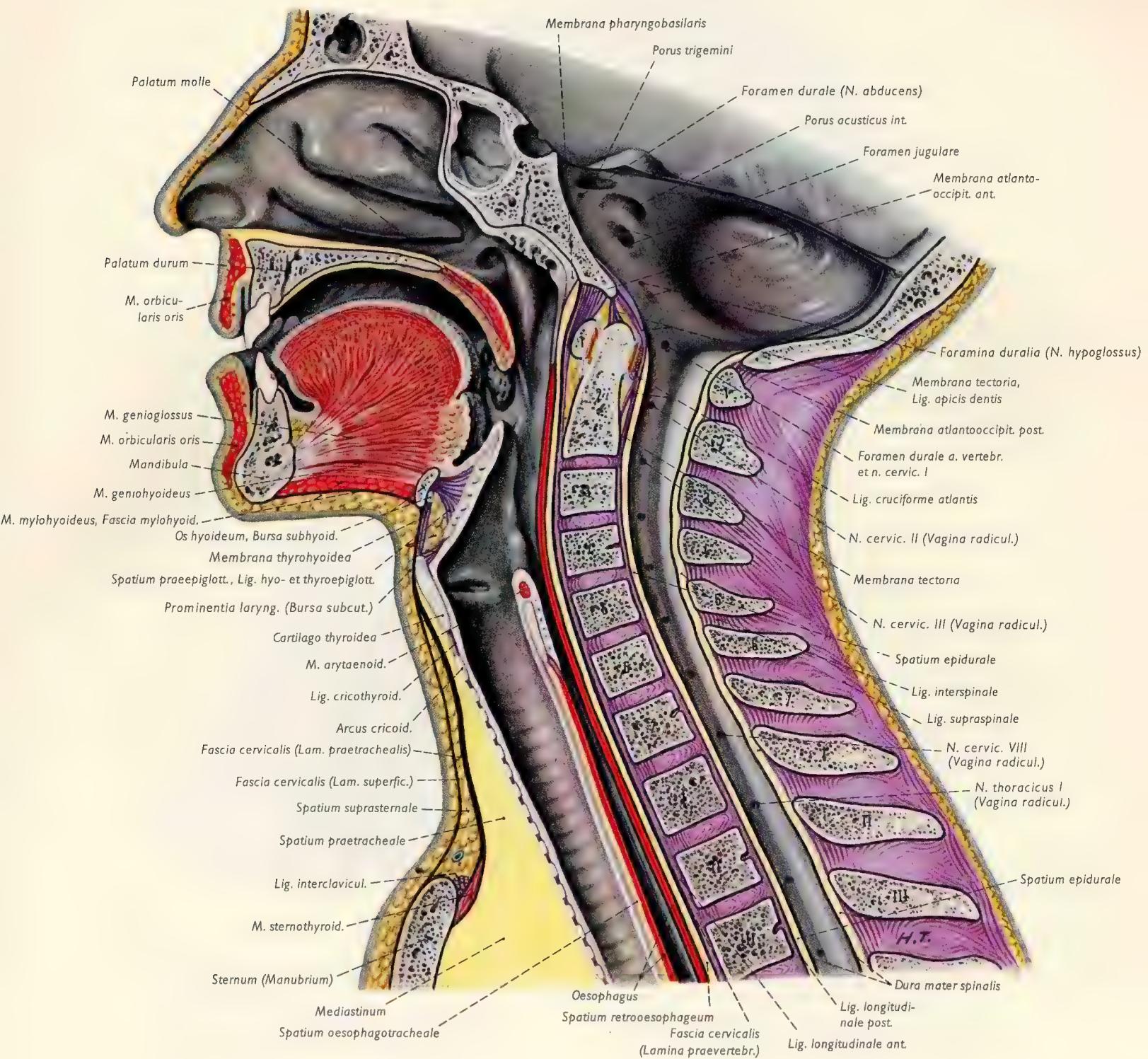
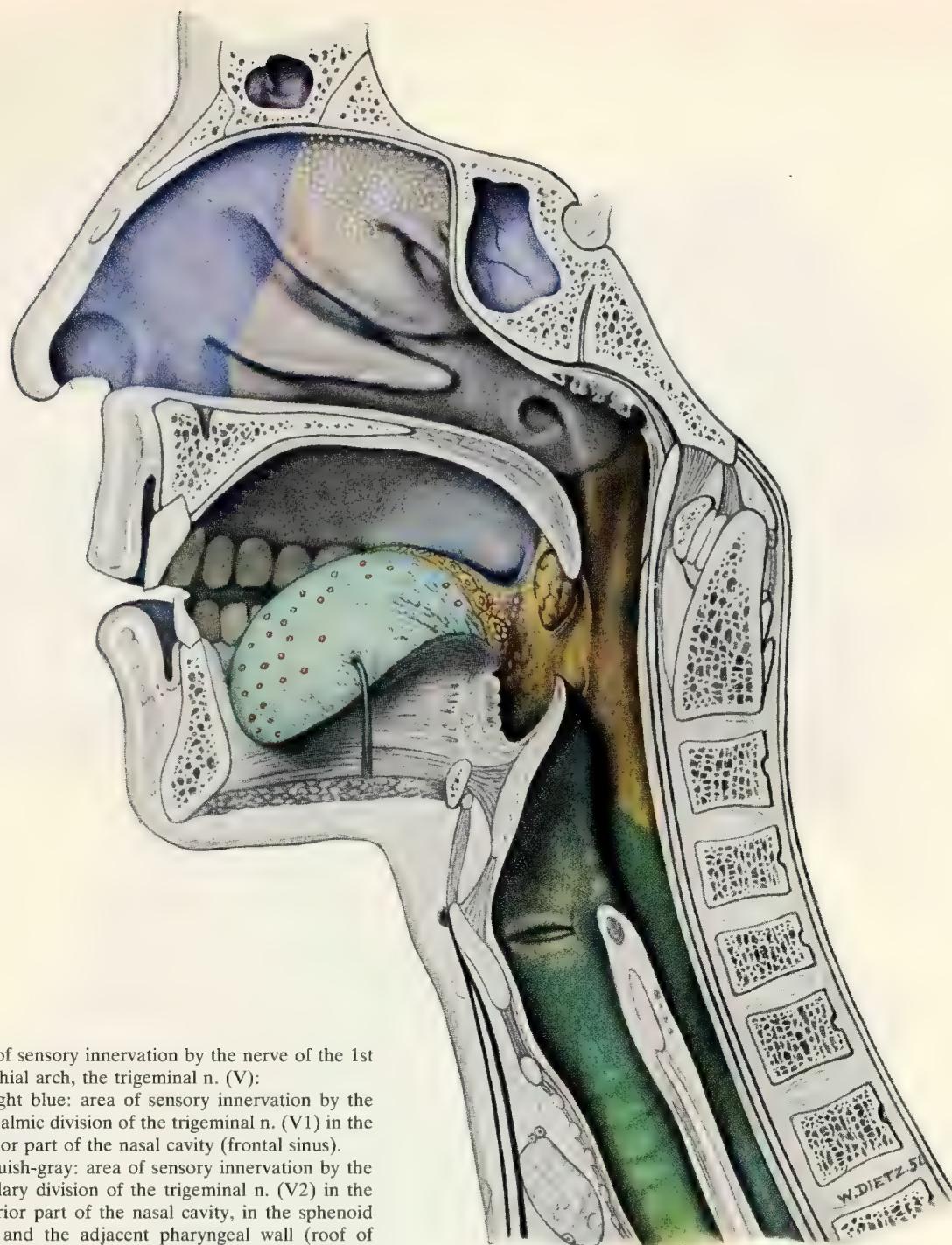


Fig. 257. Median section through the neck and adjoining head region.



Blue = area of sensory innervation by the nerve of the 1st branchial arch, the trigeminal n. (V):

1. Light blue: area of sensory innervation by the ophthalmic division of the trigeminal n. (V1) in the anterior part of the nasal cavity (frontal sinus).

2. Bluish-gray: area of sensory innervation by the maxillary division of the trigeminal n. (V2) in the posterior part of the nasal cavity, in the sphenoid sinus and the adjacent pharyngeal wall (roof of pharynx), as well as the (nasal and oral) mucosa of the palate and the vestibule of the oral cavity. The area of sensory innervation by the olfactory nerve (I, smell) is indicated by white dots on the lateral wall of the nasal cavity (olfactory region).

3. Bluish-green: area of sensory innervation by the mandibular division of the trigeminal n. (V3) on the mucosal surface of the body of the tongue in front of the terminal sulcus, and in the vestibule of the oral cavity. Within this field the red dots indicate schematically the sensory innervation for taste sensation by the chorda tympani (of nervus intermedius). (VII = 2nd branchial n.)

Brown = area of sensory innervation by the nerve of the 3rd branchial arch, the glossopharyngeal n. (IX): The area of sensory innervation by this nerve (pharyngeal and lingual branches) in the nasal and oral parts of the pharynx, partly also on the soft palate, the isthmus of the fauces, and the root of the tongue. The white dots behind the terminal sulcus in the region of

the circumvallate papillae, the foliate region, and the adjacent mucosa of the isthmus indicate schematically the sensory innervation for taste sensation by the glossopharyngeal nerve.

Green = area of innervation by the nerve of the 4th and 6th branchial arches, the vagus nerve (X):

1. Light green: area of sensory innervation by the pharyngeal branches and the sup. laryngeal n. (of the 4th branchial nerve) in the upper part of larynx, the vallecula, and the laryngeal part of pharynx.

2. Dark green: area of sensory innervation by the pharyngeal branches and the inf. laryngeal n. (of the 6th branchial nerve) in the laryngeal part of pharynx, the esophagus, the lower part of larynx, and the trachea. These 2 fields of innervation overlap in the area of the vocal cords.

Fig. 258. The sensory innervation of the mucosa of the upper gastrointestinal and respiratory tracts in the head and neck shown in a median section (right half of section).

Topography of the Neck Regions

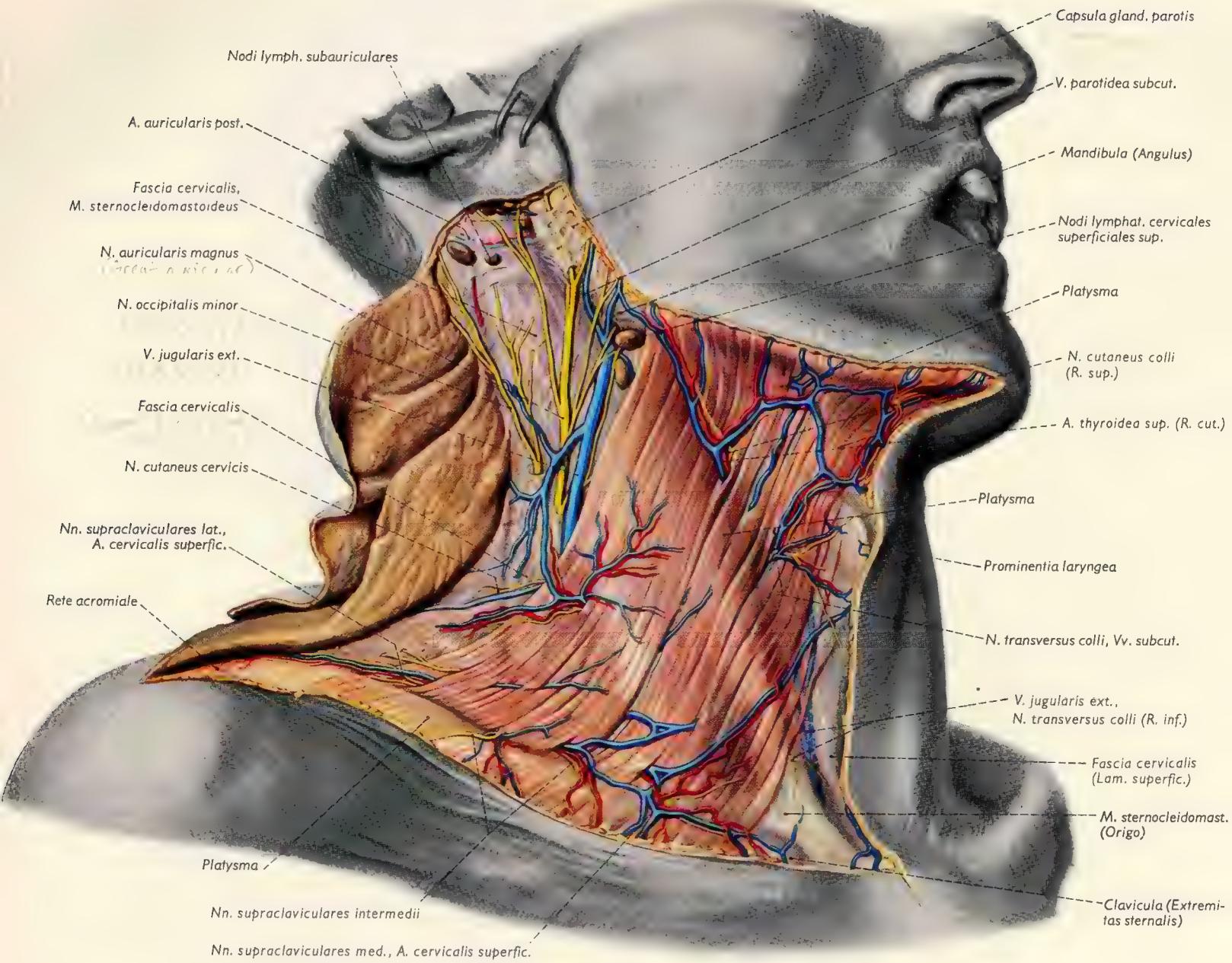


Fig. 259. Superficial layers of the neck. The platysma and subcutaneous structures in the anterior and posterior triangles.

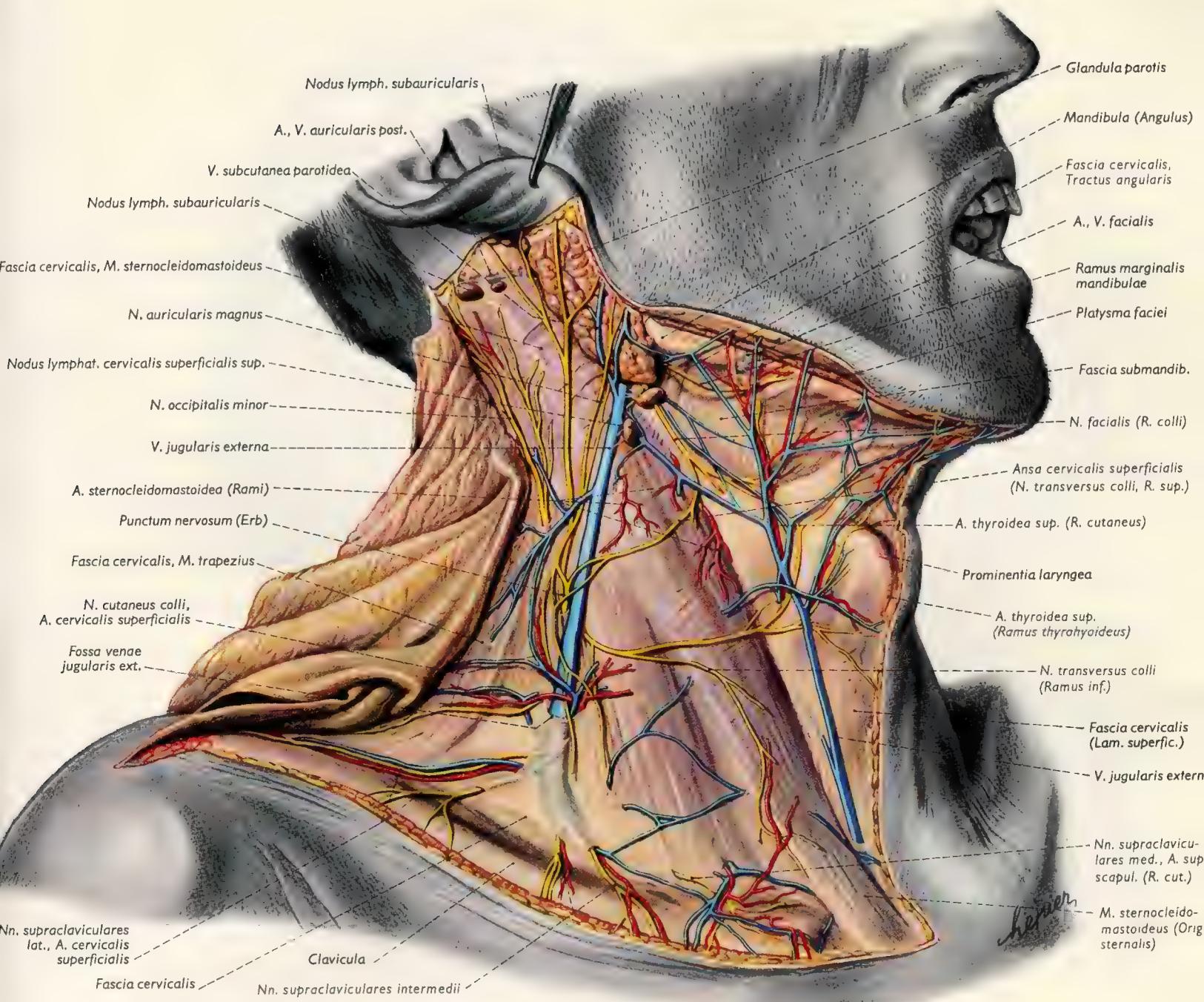


Fig. 260. Superficial layers of the neck after removal of the platysma. Dissection of subcutaneous structures on the ventrolateral aspect of the cervical fascia as well as the cervical pole of the parotid gland in the retromandibular fossa.

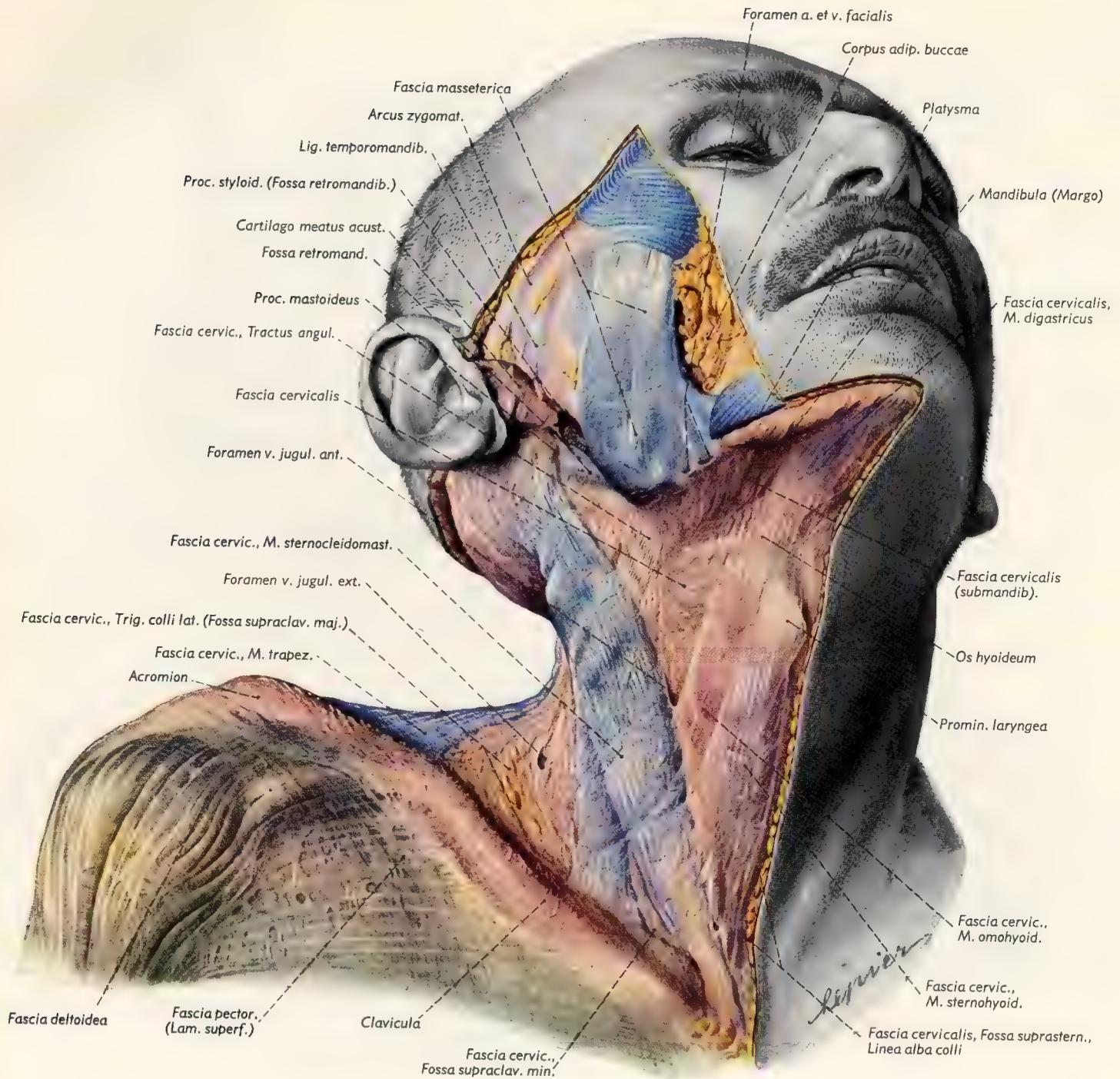


Fig. 261. The superficial layer of the cervical fascia. The skin, subcutaneous tissue, and platysma have been removed from the face and neck on the right side.

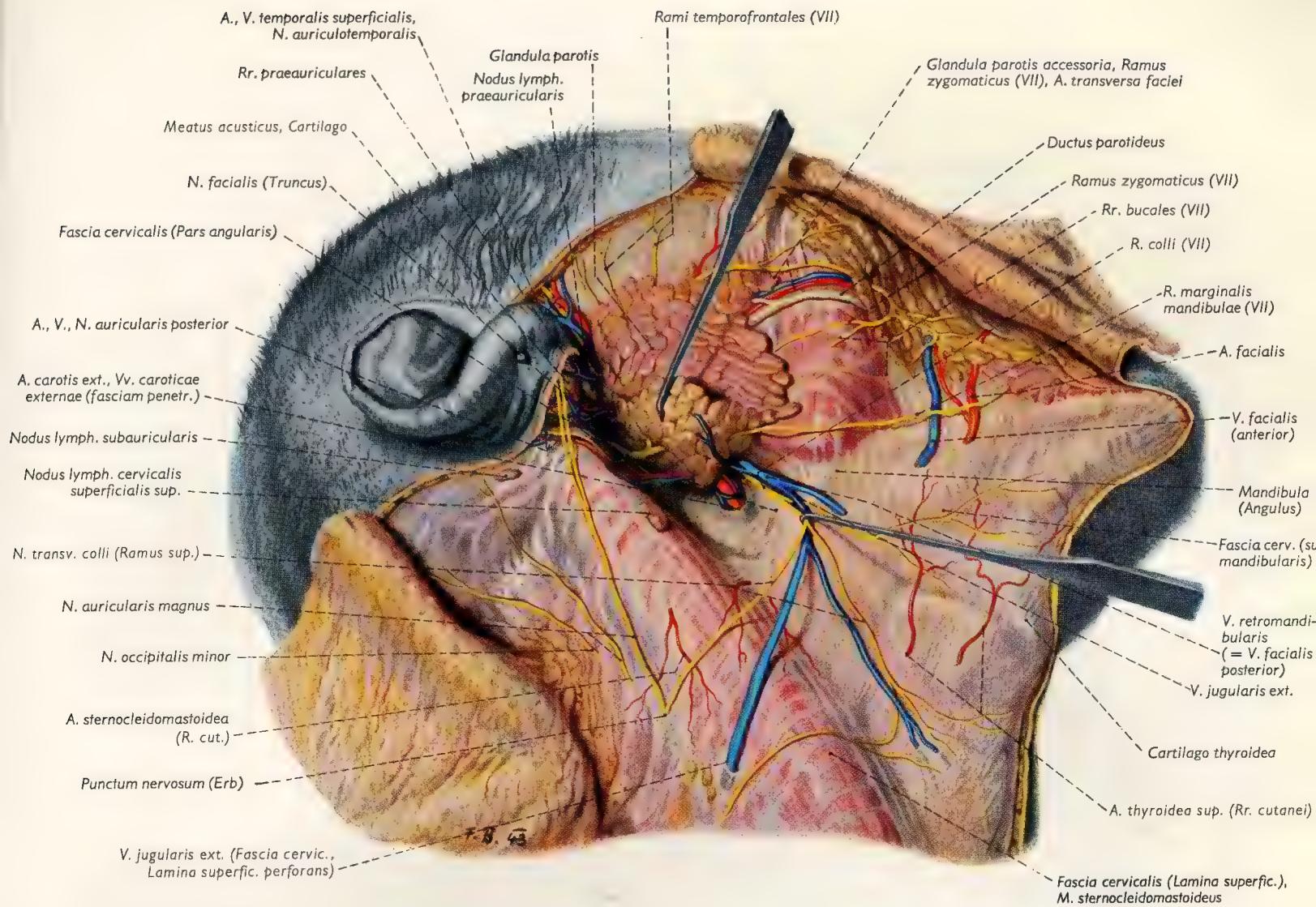


Fig. 262. The parotid gland, the retromandibular fossa, the submandibular and carotid triangles after removal of the skin and platysma. The cutaneous branches of the cervical plexus emerge at Erb's point.

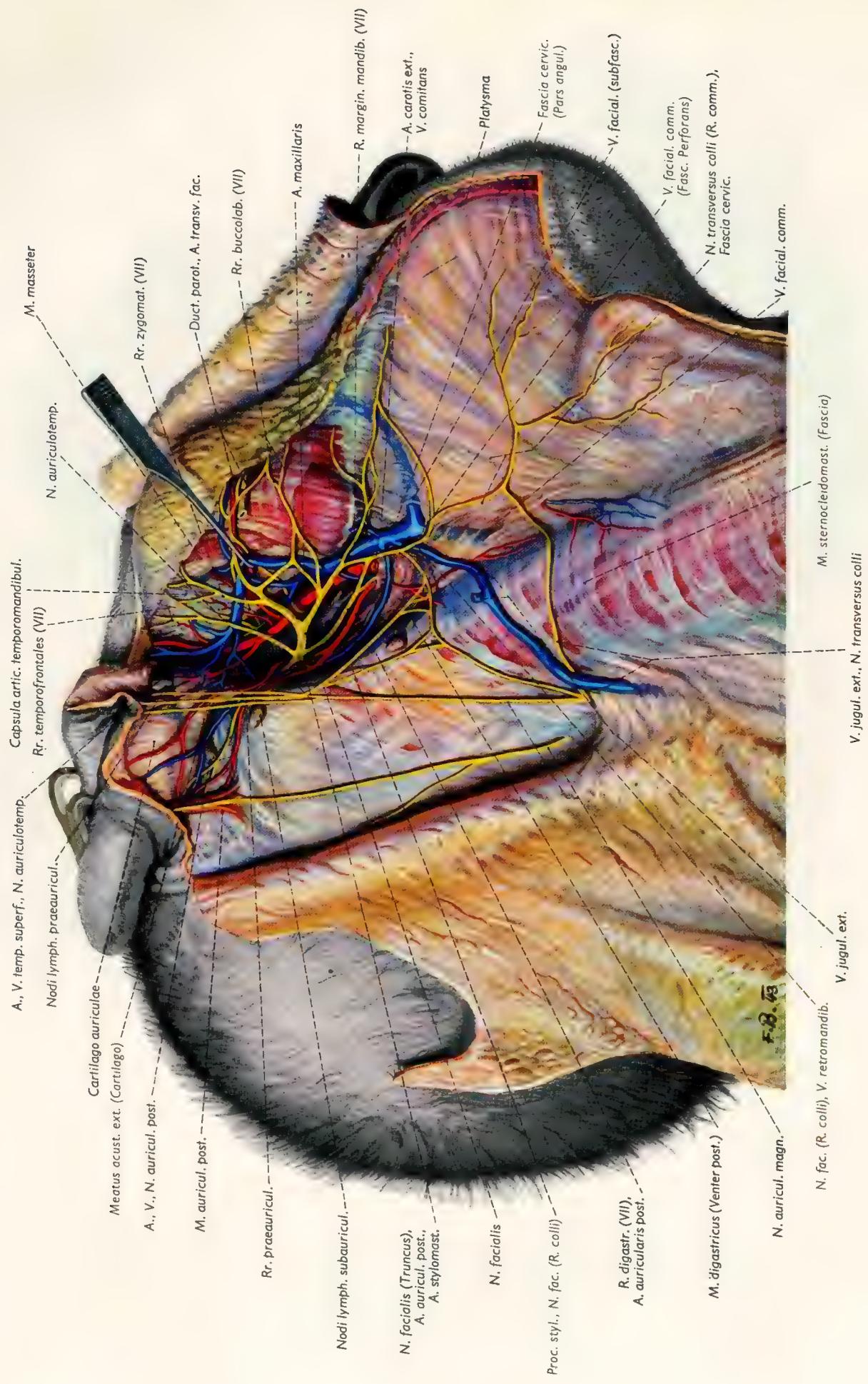


Fig. 263. Dissection of the retromandibular fossa showing vessels and nerves in the parotid bed after removal of the parotid gland but retaining its fascia.

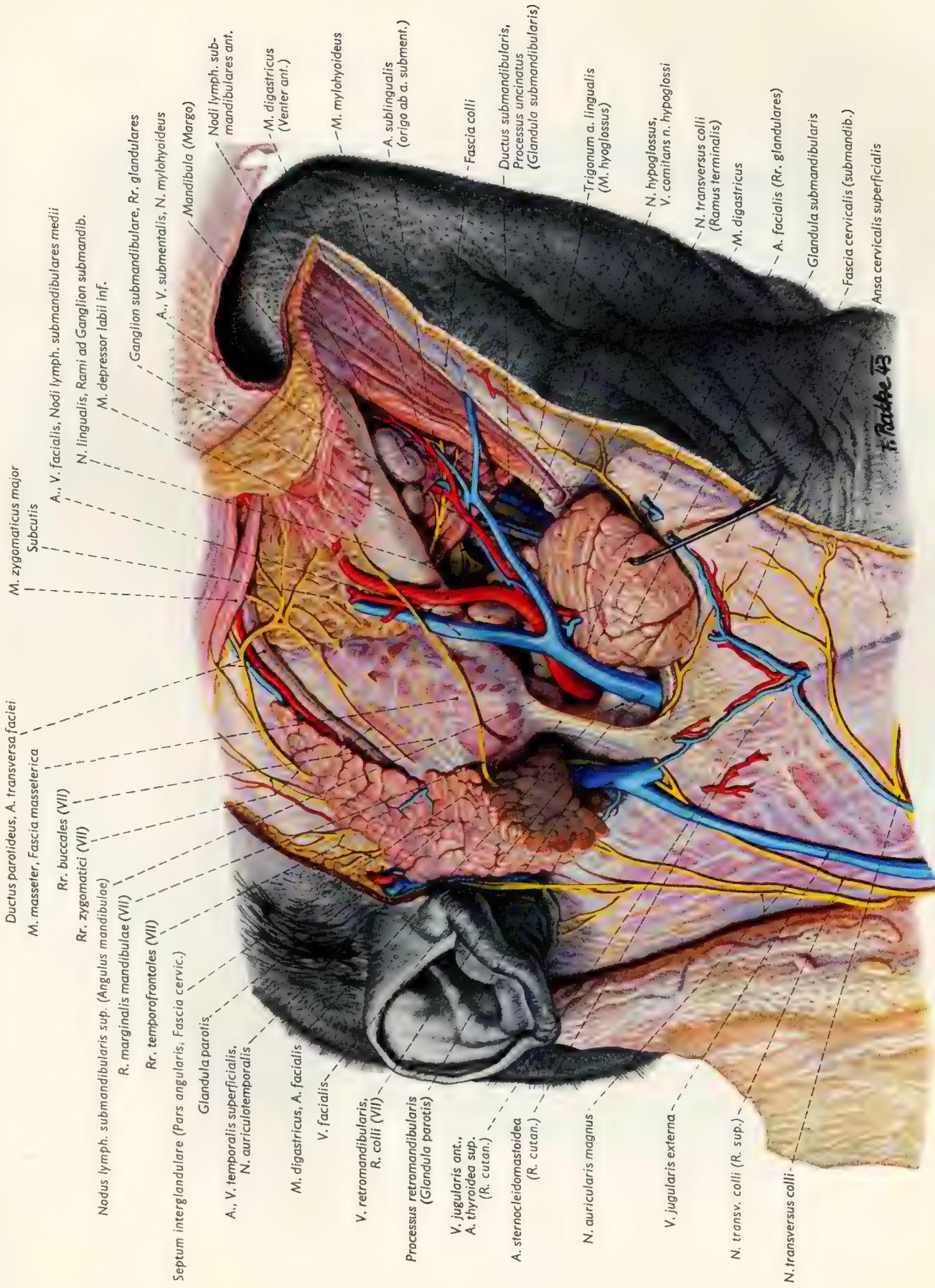


Fig. 264. Regional dissection of the submandibular triangle showing the submandibular gland and the subfascial vessels and nerves.

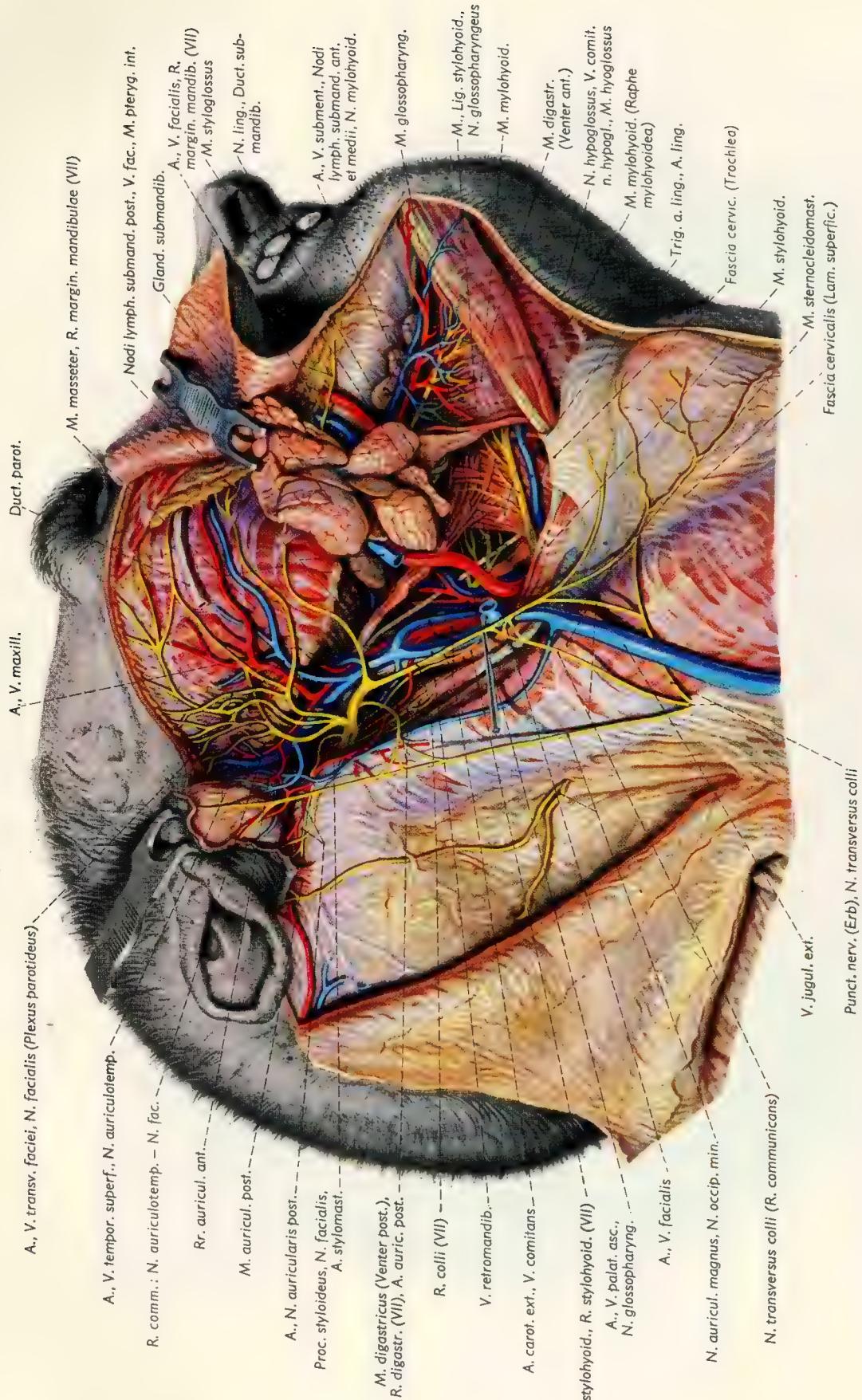


Fig. 265. Regional dissection of the submandibular triangle and the submandibular fossa.

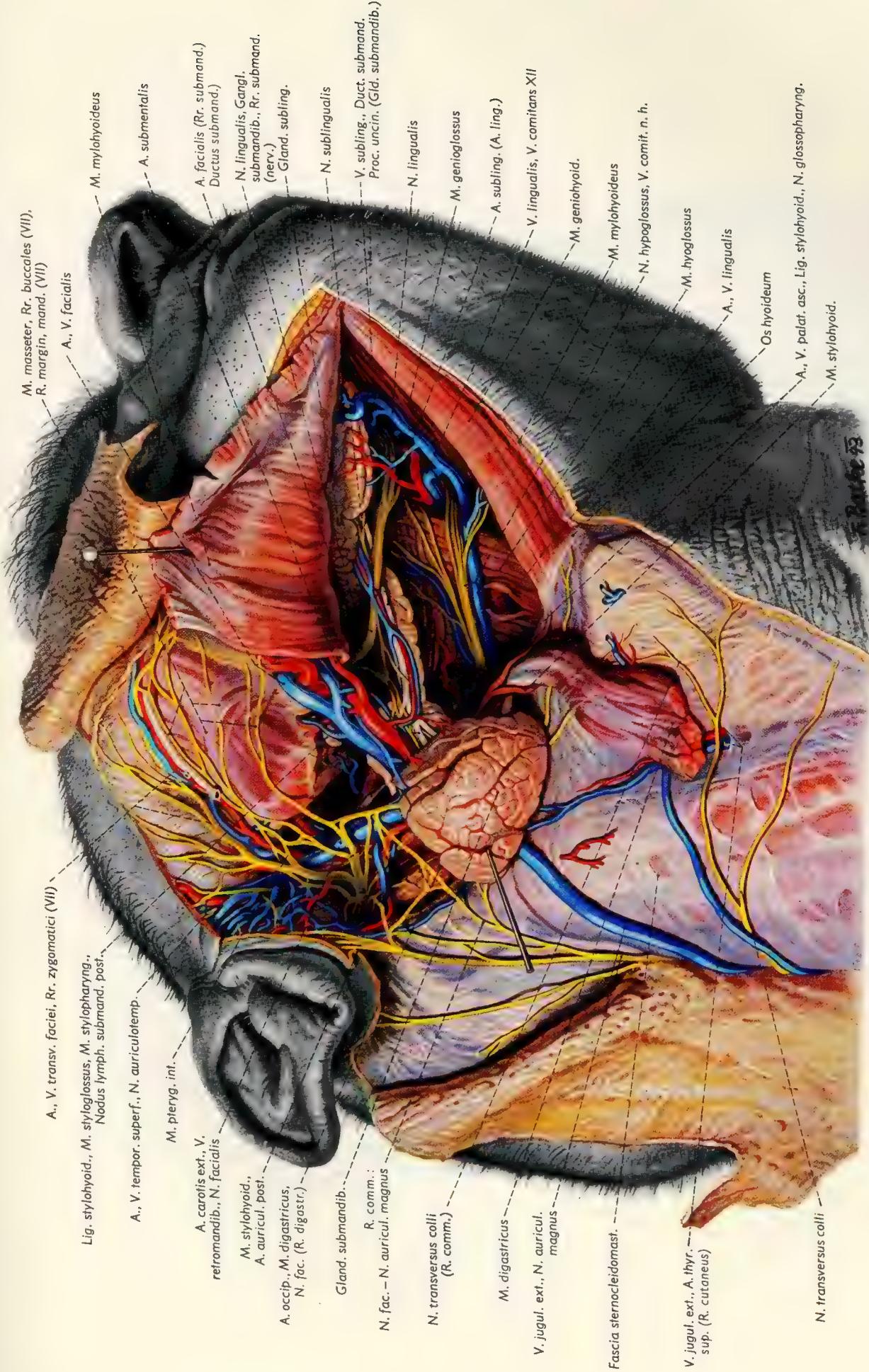


Fig. 266. Regional dissection of the deep aspects of the submandibular triangle and the retromandibular fossa, showing the paralingual structures in the floor of the mouth. The digastric muscle has been divided; the mylohyoid muscle has been incised along its raphe and reflected upward. Note the lingual trigone with the exposed lingual artery.

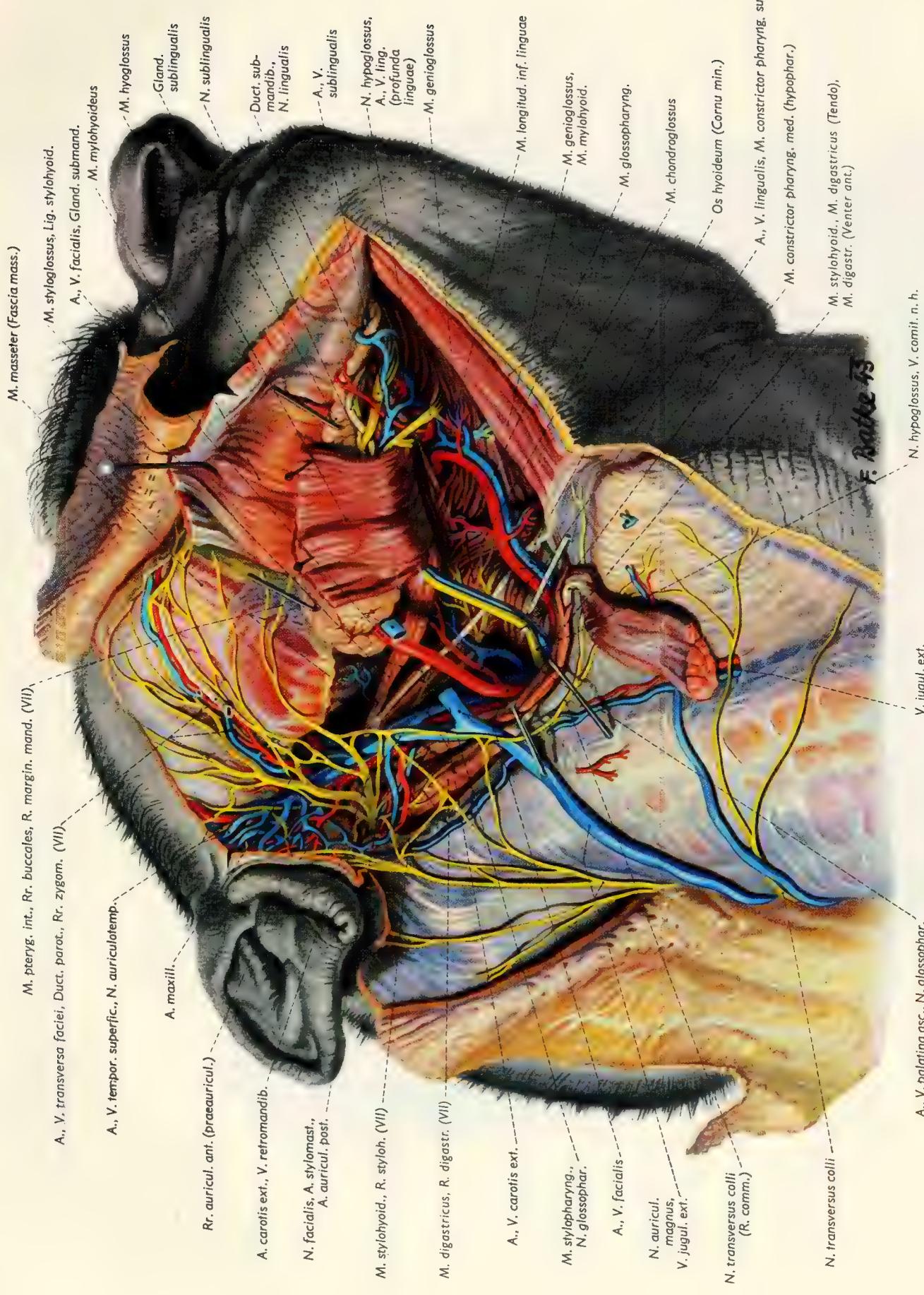


Fig. 267. Regional dissection of submandibular triangle and retromandibular fossa showing paralingual structures after dividing and retracting the mylohyoid and hyoglossus muscles.

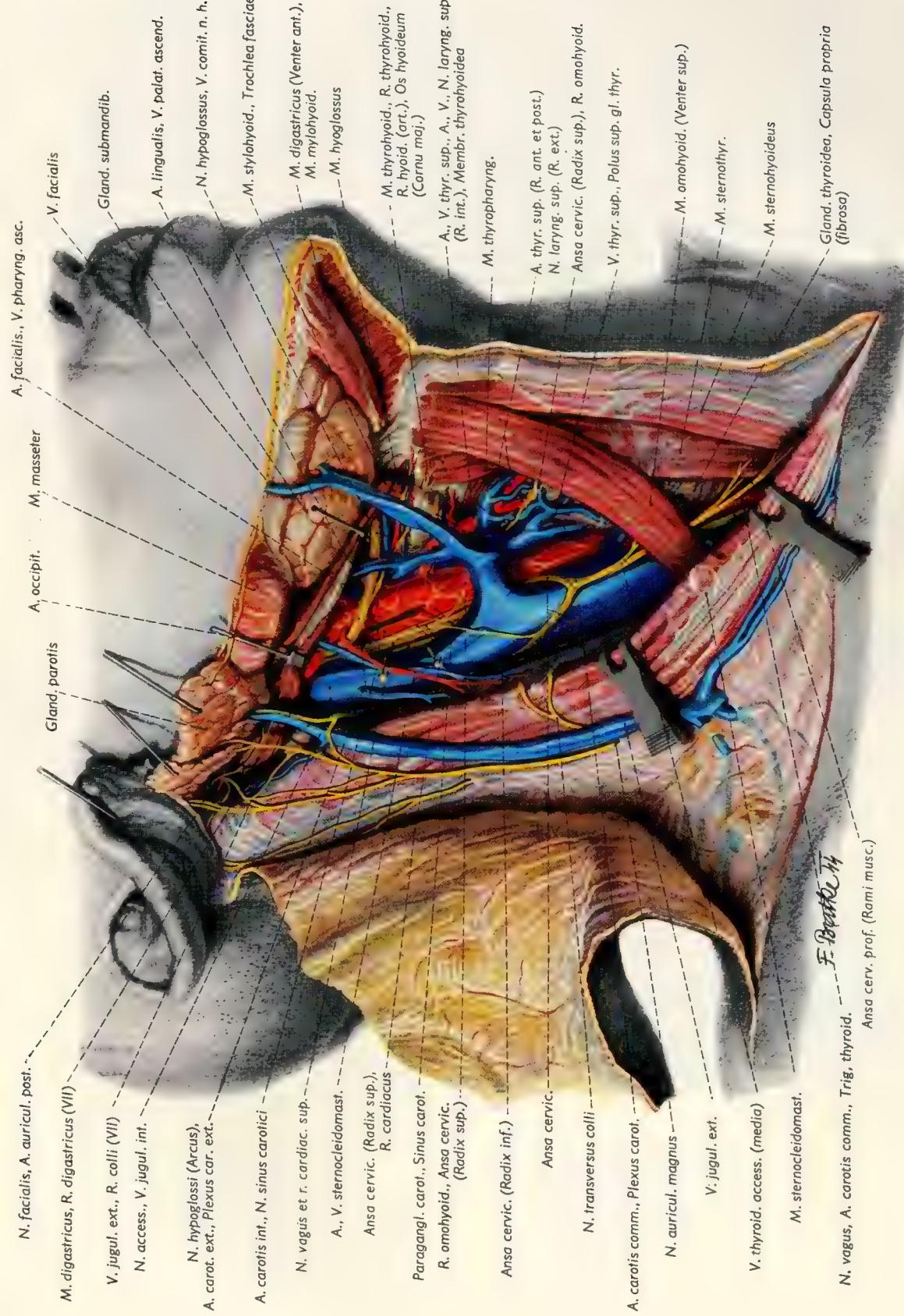


Fig. 268. Regional dissection of structures in the carotid triangle. Exposure of subfascial structures in the carotid triangle and in the thyroid triangle (between the omohyoidei, the sternothyroid, and the sternocleidomastoid muscles).

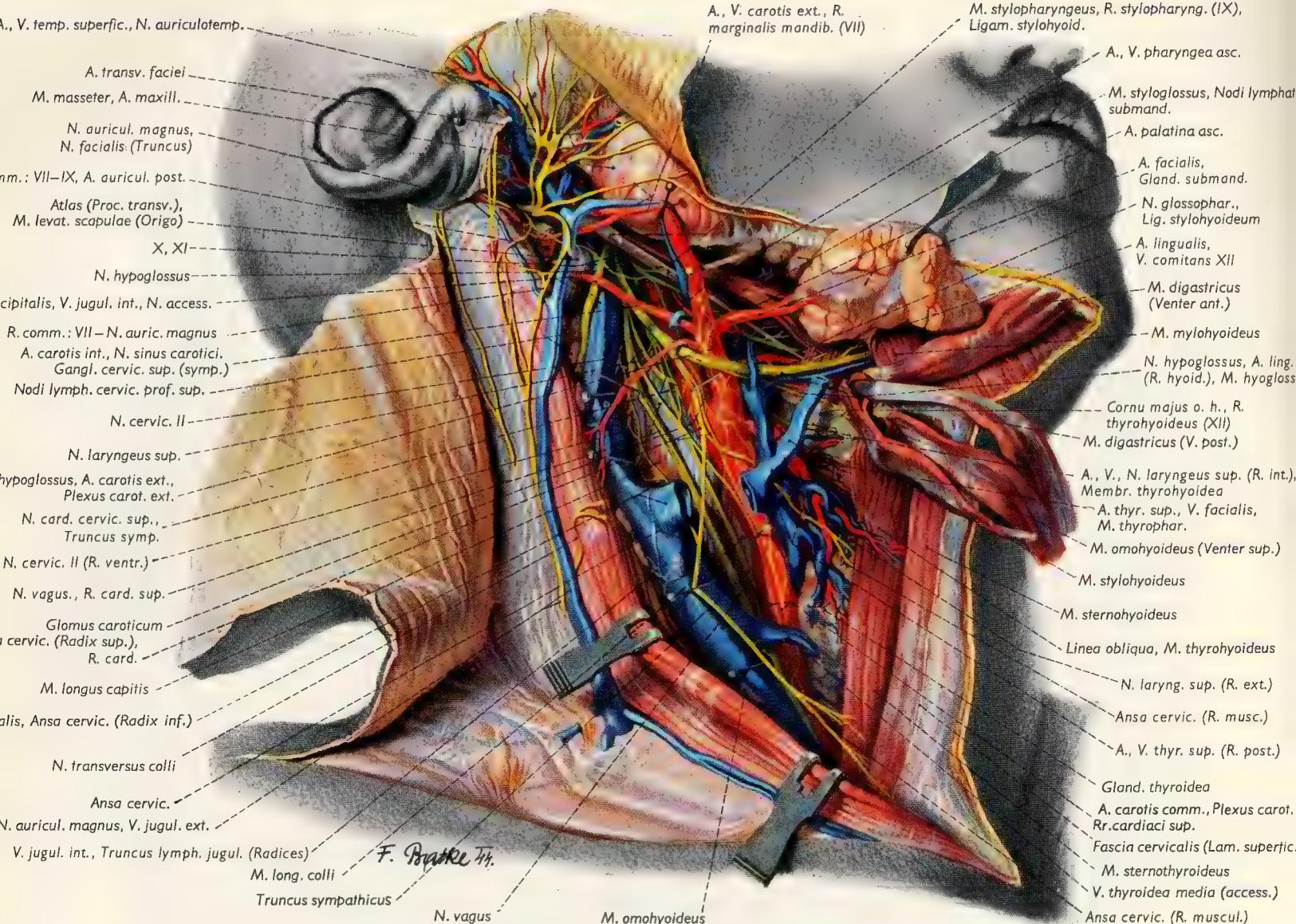
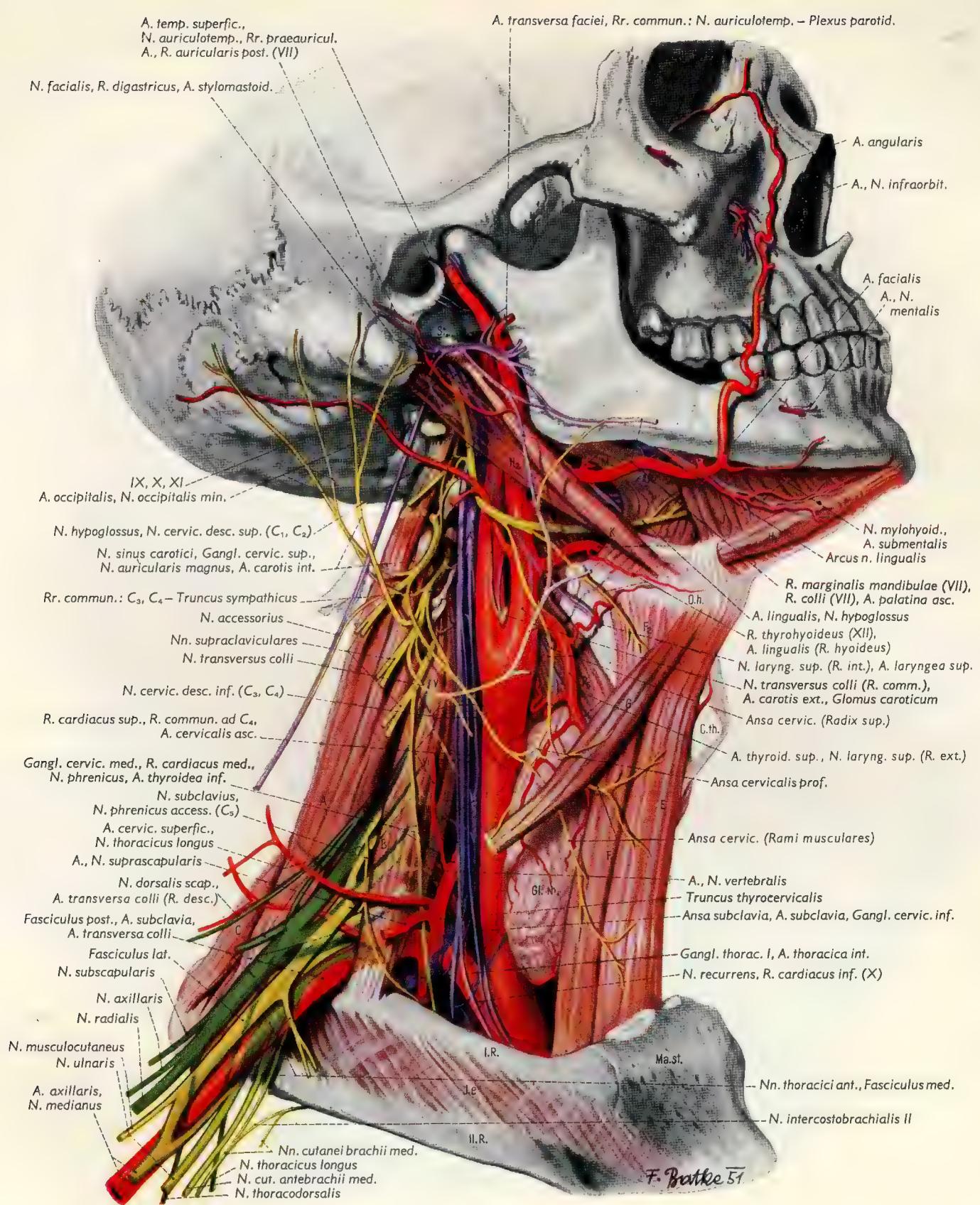


Fig. 269. Deep aspect of the anterior cervical triangle. Regional dissection of vessels and nerves in the carotid and submandibular triangles, as well as the retromandibular fossa.

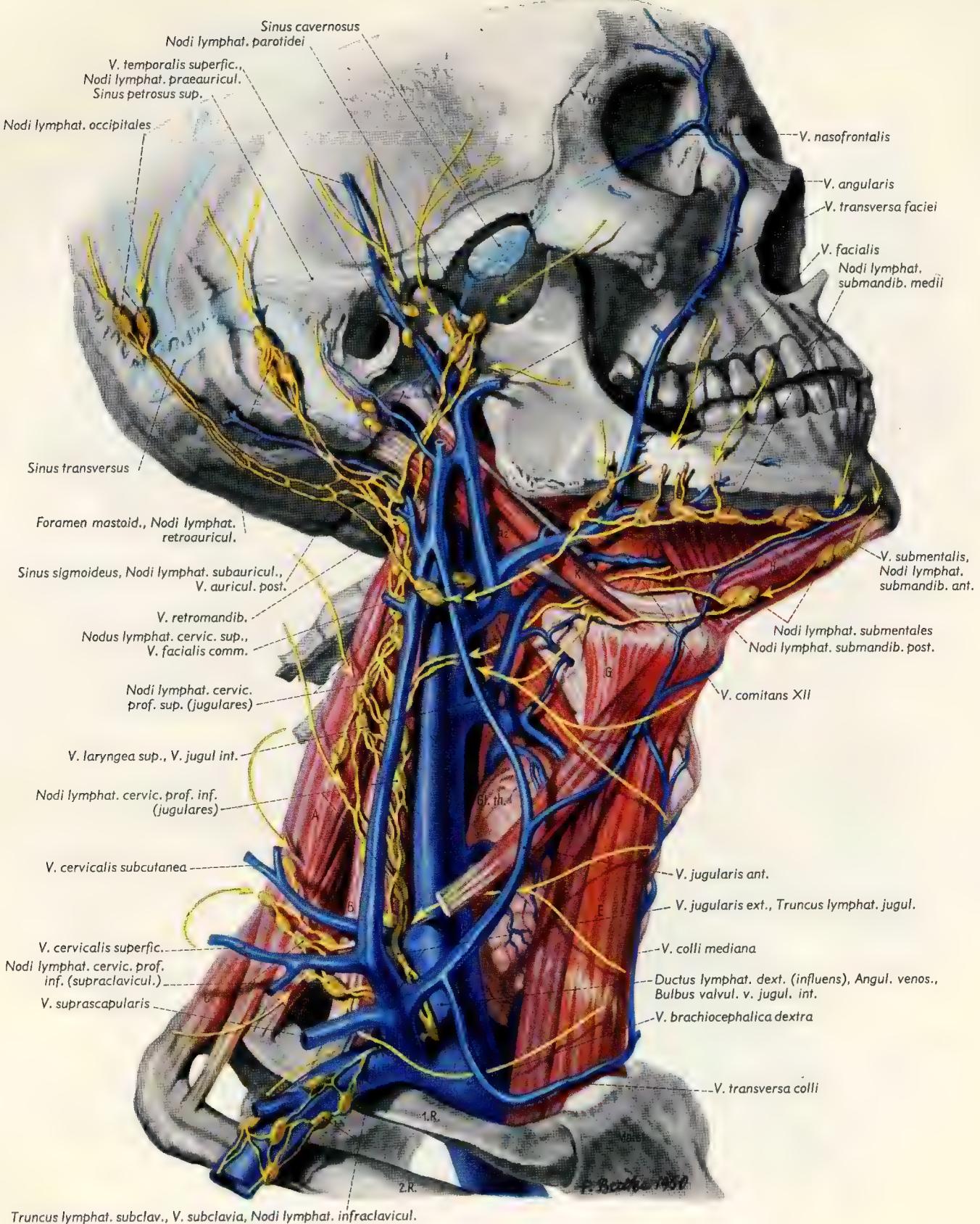


A = M. scalenus medius
 B = M. scalenus ant.
 C = M. scalenus post.
 C.th = Cartilago thyroidea
 E = M. sternohyoideus
 F₁ = M. sternothyroideus
 F₂ = M. thyrohyoideus
 G = M. omohyoideus (Venter sup.)
 Gl.th = Glandula thyroidea

H₁ = M. digastricus (Venter ant.)
 H₂ = M. digastricus (Venter post.)
 J = M. mylohyoideus
 J.e = M. intercostalis ext.
 K = M. stylohyoideus
 L = M. hyoglossus
 M = M. styloglossus
 Ma.st = Manubrium sterni
 O.h = Os hyoideum

P_s = M. thyropharyngeus
 St = Processus styloideus
 I-VIII = ventral ramus of
 1st-8th cervical nerves
 I = ventral ramus of
 1st thoracic nerve
 I.,II.R = 1st and 2nd ribs

Fig. 270. Arteries and nerves of the neck, from the right side. The shoulder girdle, the sternocleidomastoid, and the posterior neck muscles have been removed.



A = M. scalenus med.
 B = M. scalenus ant.
 C = M. scalenus post.
 D = M. omohyoideus (Venter sup.)
 E = M. sternohyoid.

F = M. sternothyroid.
 G = M. thyrohyoid.
 Gl.th = Glandula thyroid.
 H₁ = M. digastricus (Venter ant.)
 H₂ = M. digastricus (Venter post.)
 J = M. mylohyoid.

K = M. stylohyoid.
 L = M. hyoglossus
 M = M. styloglossus
 Ma.st = Manubrium sterni
 1.,2R = 1st and 2nd ribs

Fig. 271. Veins, lymph vessels, and lymph nodes of the neck, seen from the right after removal of the shoulder girdle, the sternocleidomastoid, and the posterior neck muscles. The direction of lymph flow is schematically indicated by yellow arrows.

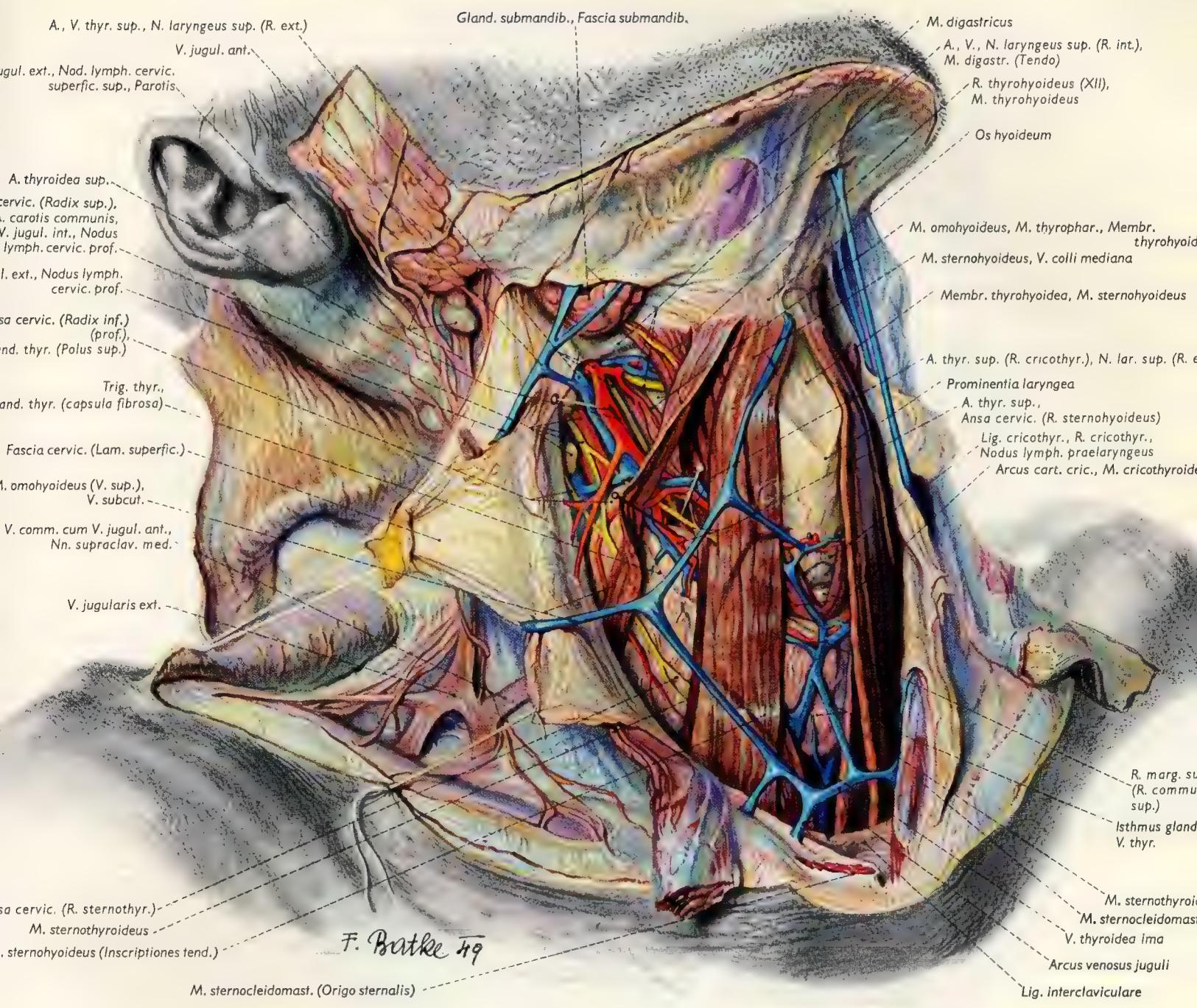


Fig. 272. Blood vesels, nerves, and muscles in the midline of the neck and in the carotid triangle (superficial). Laryngeal cartilages and thyroid gland.

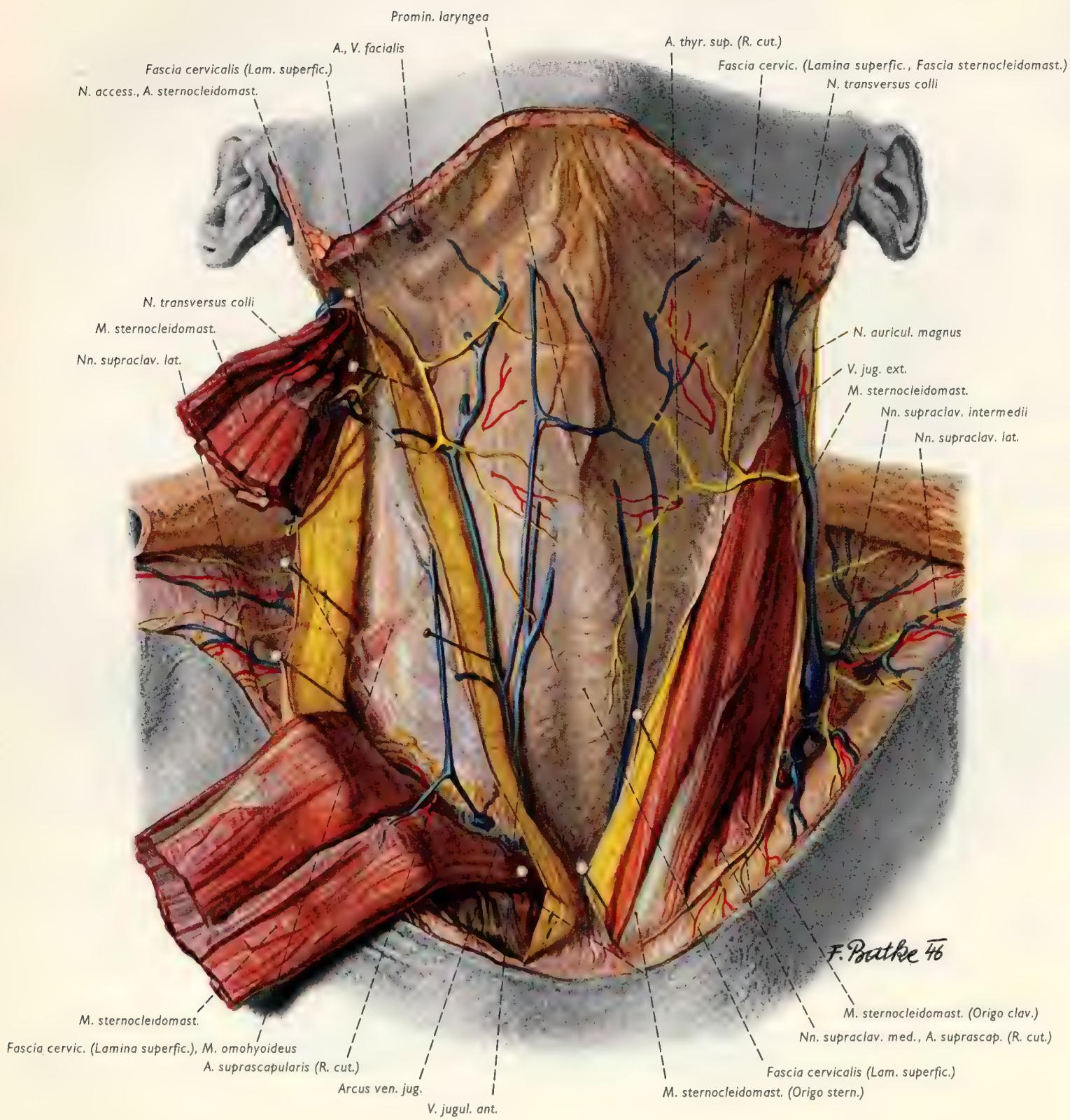


Fig. 273. Sternocleidomastoid region. Exposure of the infrahyoid area of the anterior neck region showing both laminae of the cervical fascia.

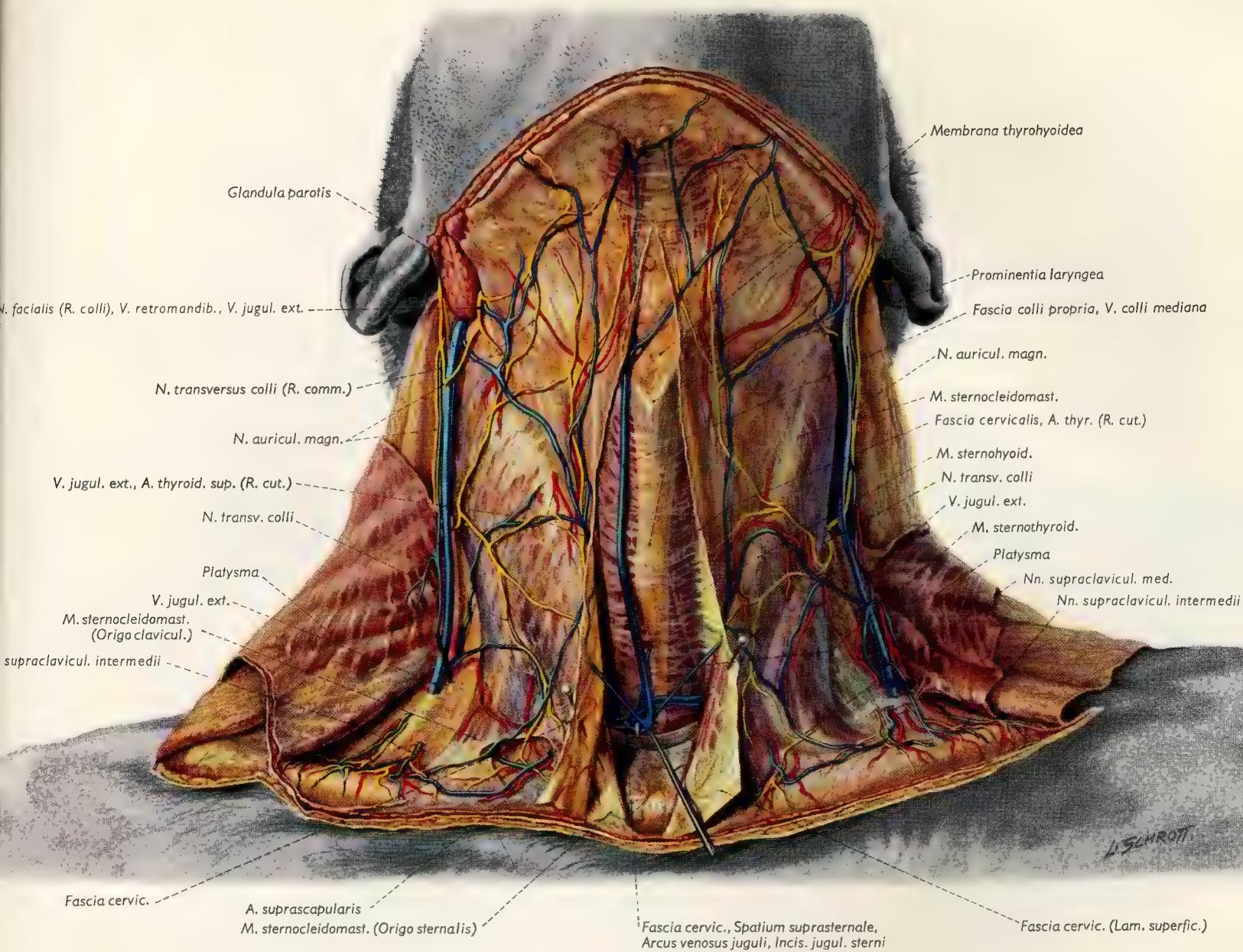
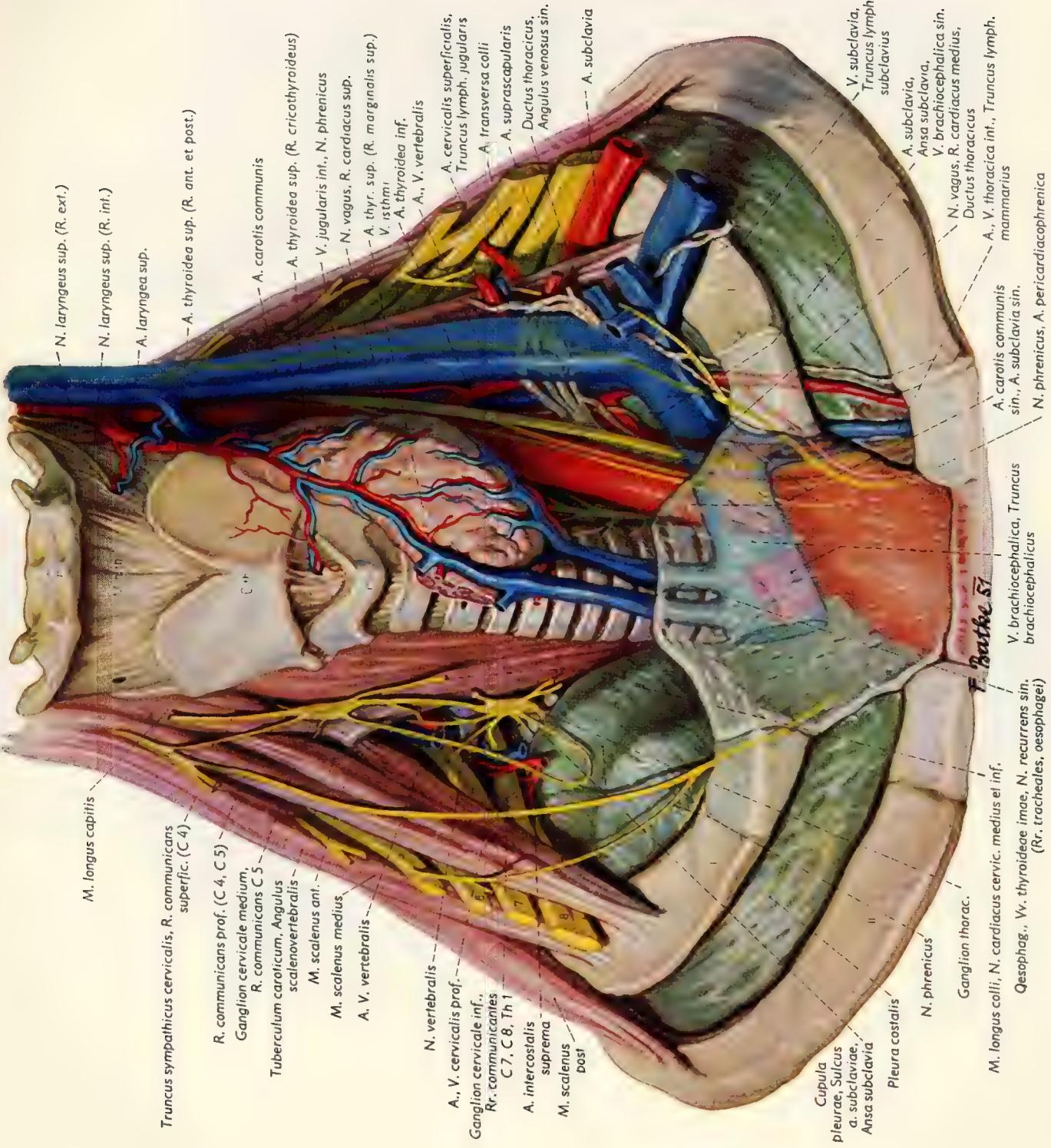


Fig. 274. Superficial dissection of the ventrolateral aspects of the neck and the suprasternal fossa. The suprasternal space (interfascial) has been opened.



C.cr = Cartilago cricoidea
C.th = Cartilago thyroidea
L.c = Lig. conicum

4-8 = ventral rami of 4th-8th cervical nerves
I,II. = 1st and 2nd rib

1 = ventral ramus of 1st thoracic nerve

M.h.th = Membrana thyrohoidea
1,II. = 1st and 2nd rib

Qesophag., Wv. thyroideae imae, N. recurrens sin. (Rv. trachealis, oesophagei)

Fig. 275. Topography of the superior thoracic aperture, the cupula of the pleura, and the scalenovertebral triangle.

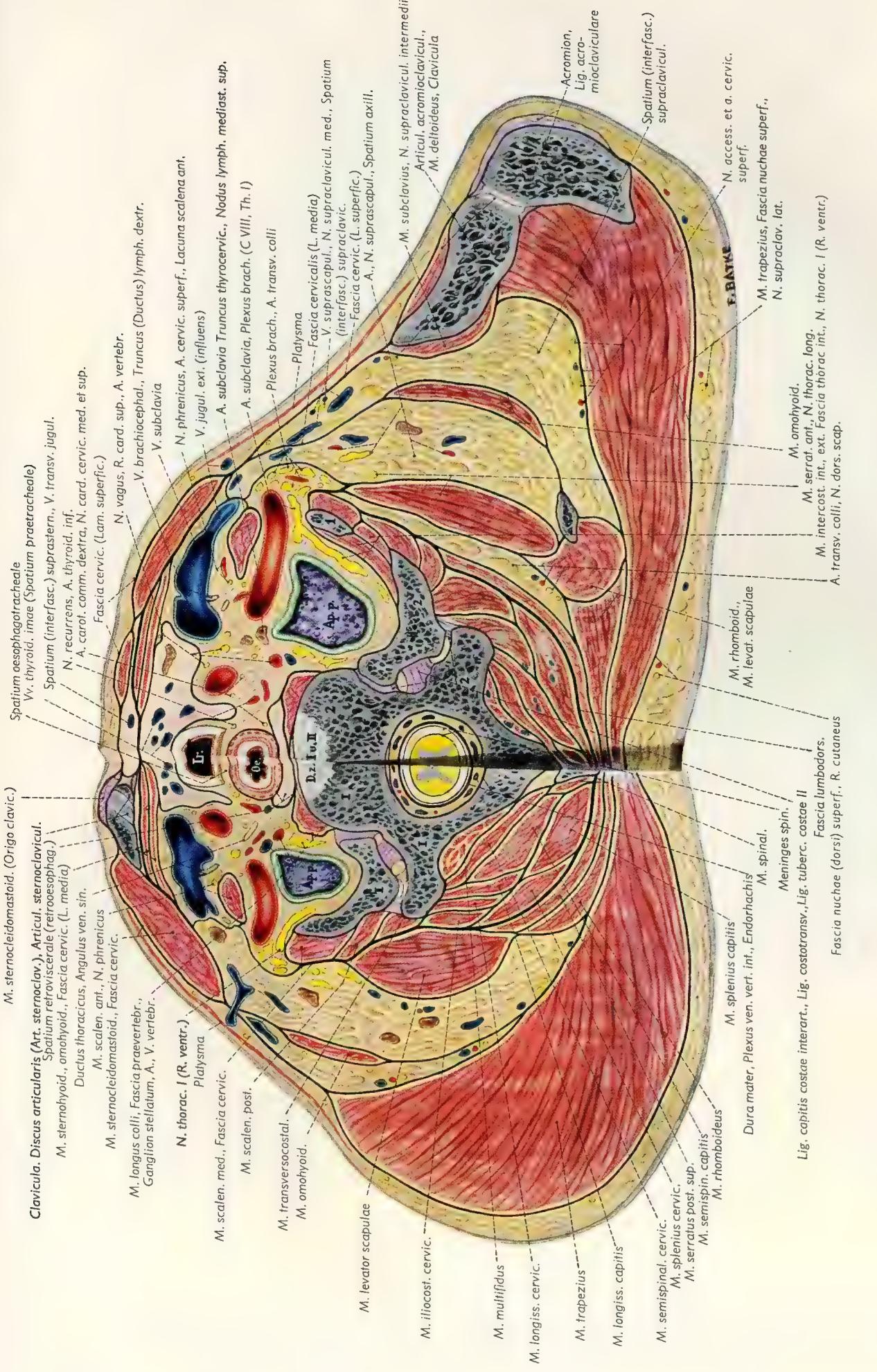


Fig. 276. Cross section at the level of the superior thoracic aperture and the cupula of the pleura. The planes of sectioning on the right and left sides of the midline are inclined differently: on the right side, the cut passes through the 2nd thoracic vertebra, the superior angle of the scapula, and the acromioclavicular joint; on the left, through the 1st thoracic vertebra, and the sternoclavicular joint (in front). Therefore, the section of the right side is deeper posteriorly and higher anteriorly when compared with the left side. The cut edge of the cervical fascia is indicated by thick lines (sections viewed from above).

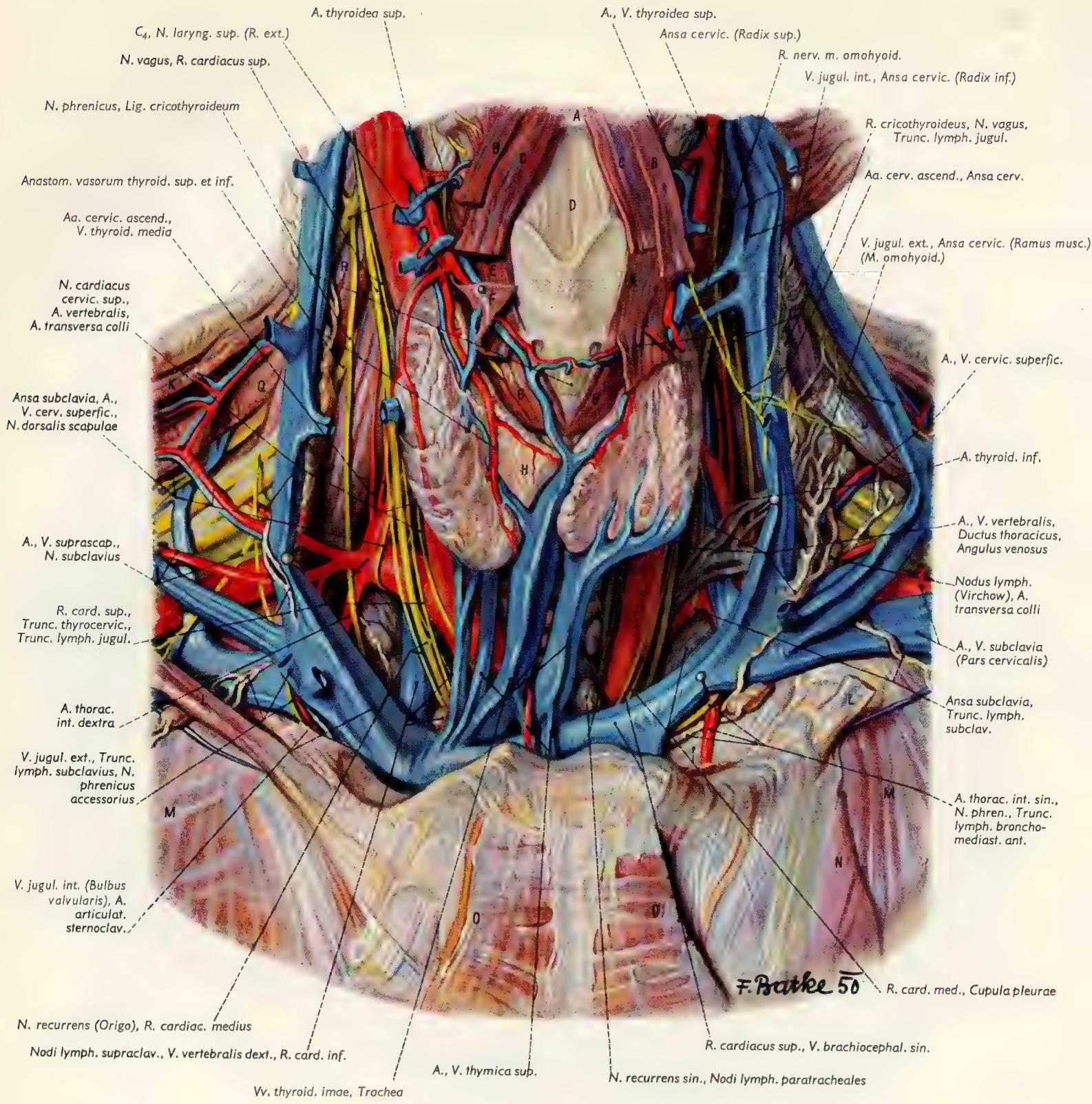
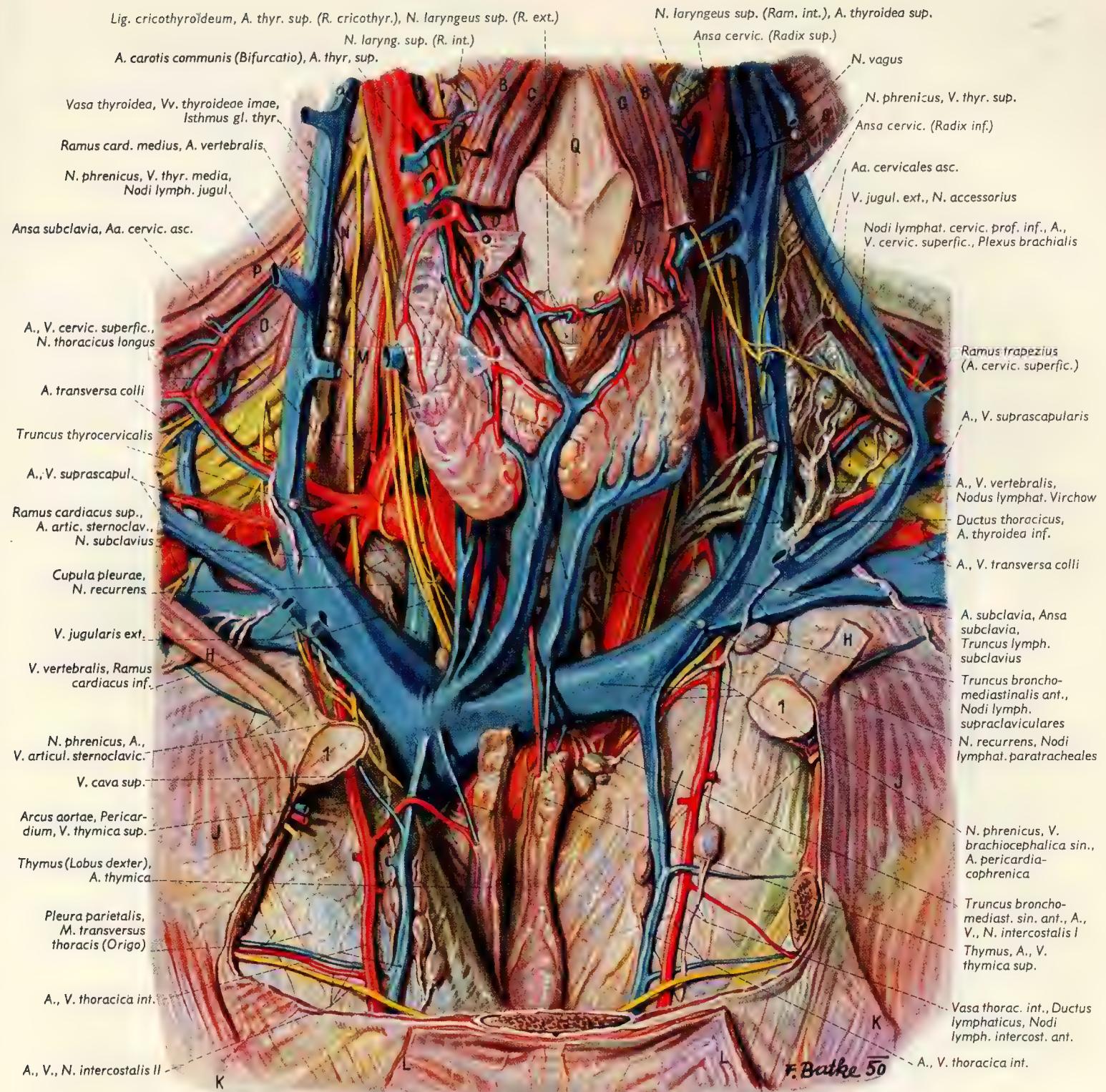
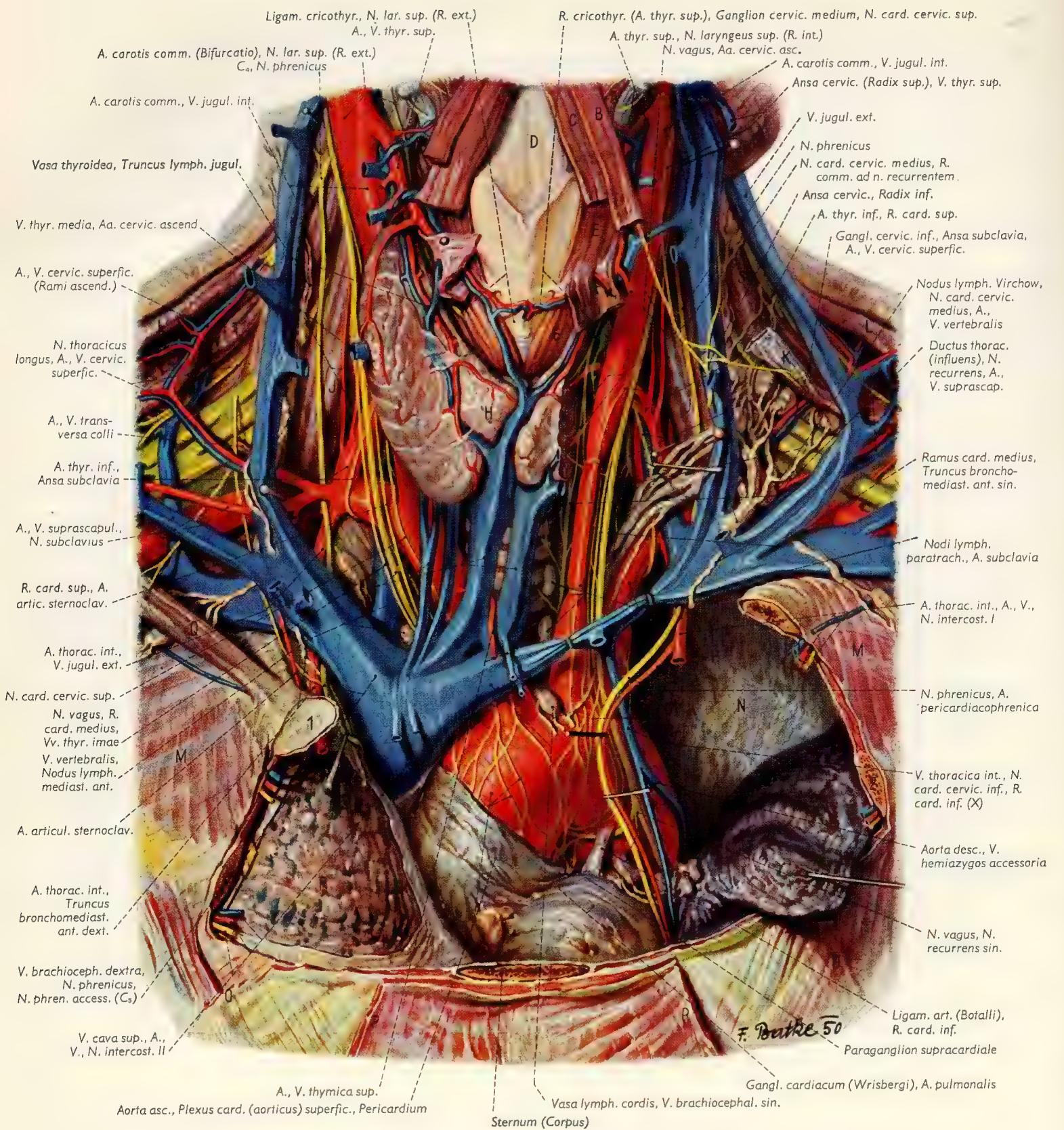


Fig. 277. Blood vessels and nerves in the lower neck region, particularly in the area of the thyroid gland, the superior thoracic aperture, the scalene lacunae, and the so-called venous angle. Note the topography of the cupula of the pleura in the superior thoracic aperture. Both clavicles have been disarticulated.



A = M. laryngopharyng.	E = M. sternothyroid.	J = M. intercost. int.	N = M. scalen. med.
B = M. omohyoïd. (V. sup.)	F = M. cricothyroid.	K = M. intercost. ext.	O = M. levator scap.
C = M. sternohyoïd.	G = M. sternocleidomast.	L = M. pect. major	P = M. trapezius
D = M. thyrohyoid.	H = M. subclavius	M = M. scalen. ant.	Q = Membr. thyrohyoidea
			1.,2. = 1.,2. Costae

Fig. 278. The sternocleidomastoid region, vessels, and nerves in the area of the superior thoracic aperture. Dissection of the thyroid gland, the cupula of the pleura, the large vessels, and nerves, and demonstration of continuity with structures in the mediastinum by partial resection of the 1st and 2nd ribs as well as the manubrium of sternum.



A = M. thyrohyoideus
B = M. omohyoideus
 (Venter sup.)
C = M. sternothyroideus
D = Membrana thyrohyoidea
E = M. thyrohyoideus

F = M. sternothyroideus
G = M. cricothyroideus
H = Isthmus glandulae thyroideae
J = M. scalenus ant.

K = M. omohyoideus
L = M. trapezius
M = M. intercostalis int.
N = Pleura costovertebralis
O = M. pectoralis minor

P = M. pectoralis major
Q = M. subclavius
R = Pulmo dexter
S = M. scalenus medius
T = M. levator scapulae
I, II = Costa prima, secunda

Fig. 279. Topography of the superior thoracic aperture and the deep neck region after removal of the manubrium of sternum, and resection of the sternal ends of the 1st and 2nd ribs. The arch of the aorta.

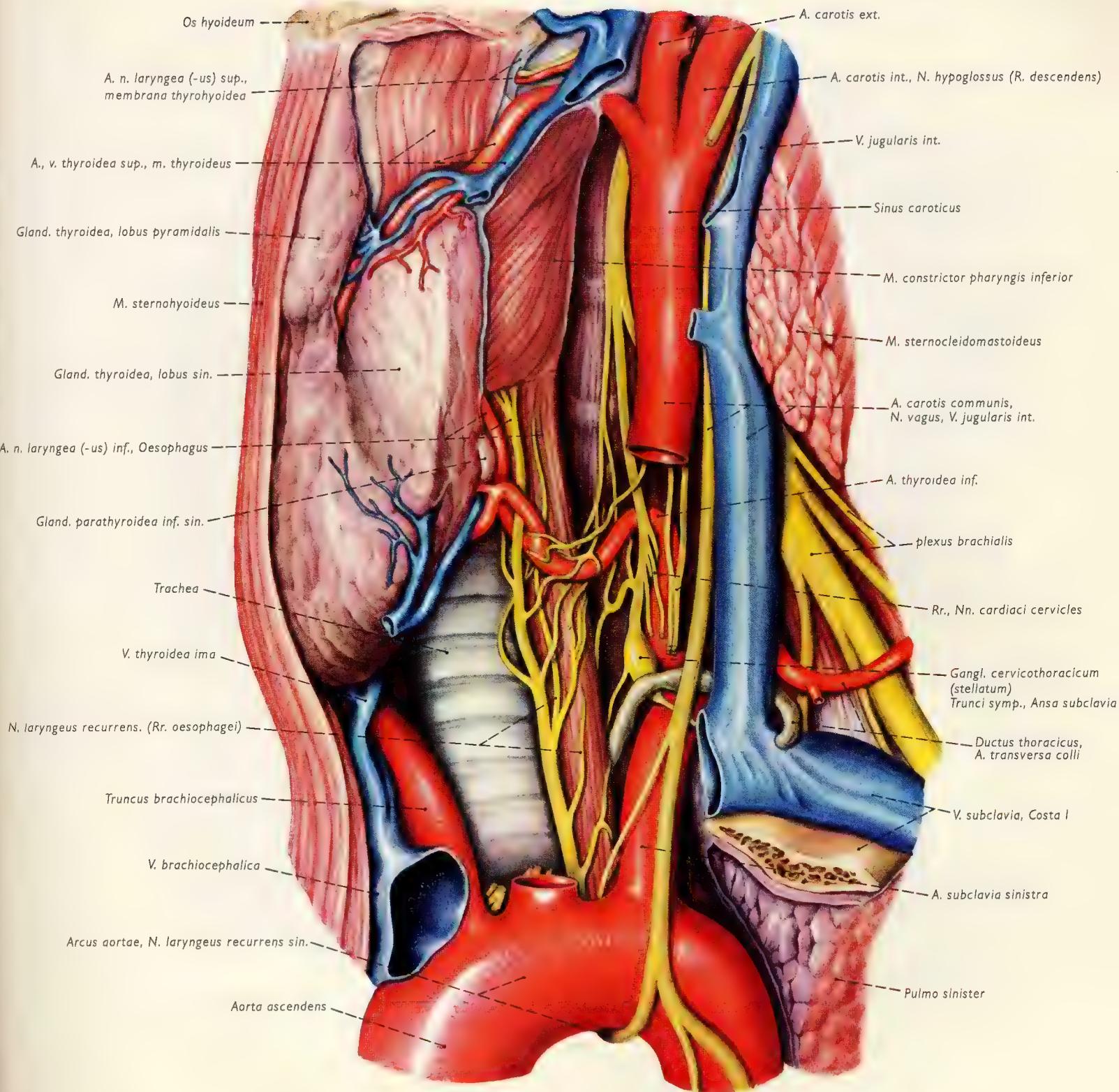


Fig. 280. Neurovascular structures of the deep neck region; opening of the thoracic duct into the venous angle (angulus venosus). Anterolateral view.

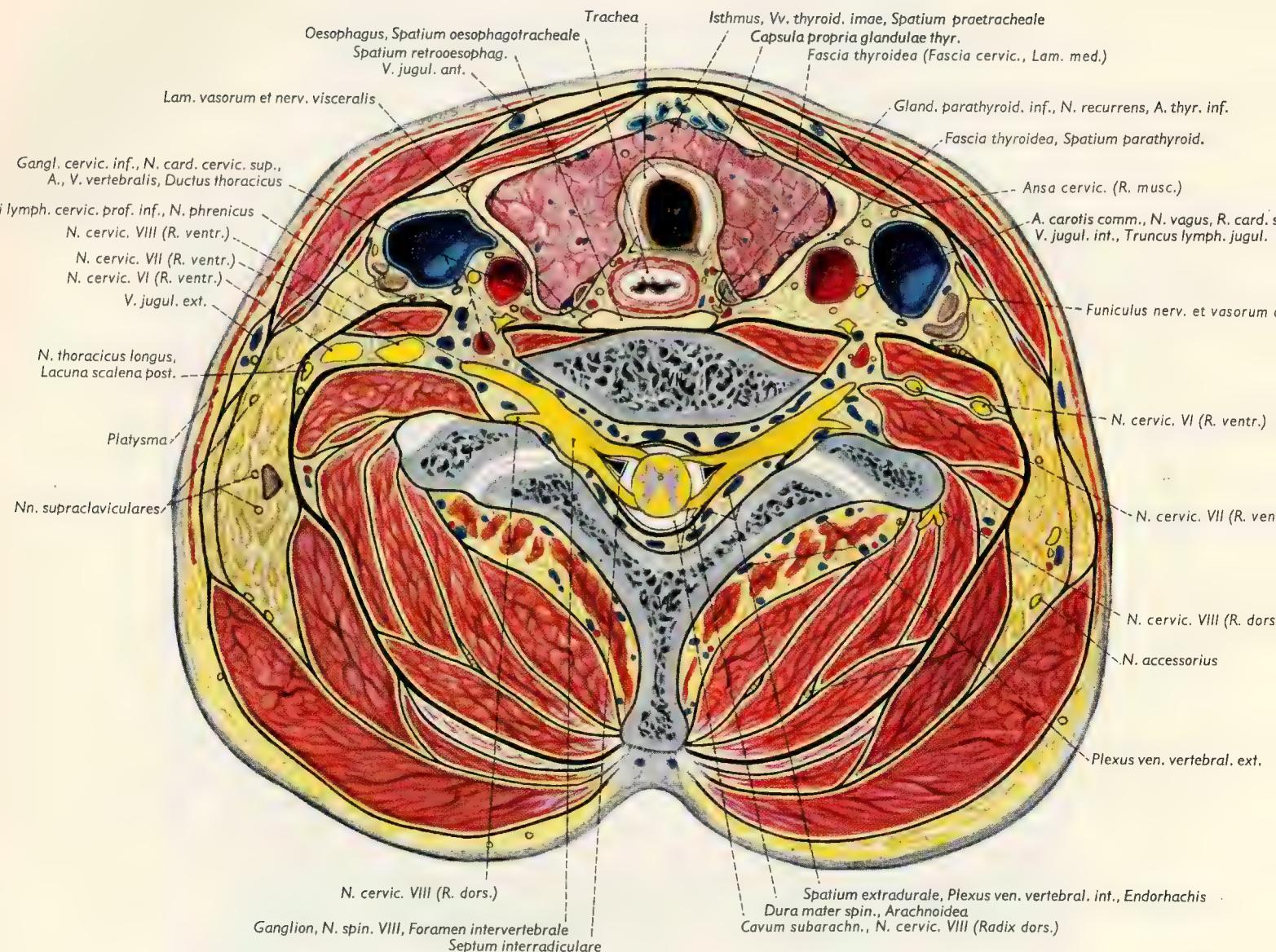


Fig. 281. Transverse section through the neck at the level of the isthmus of the thyroid gland and the 7th cervical vertebra. Illustration of the viscera, the cervical neurovascular bundles, and the perivisceral compartments in cross section. The cut edges of the fasciae are black.

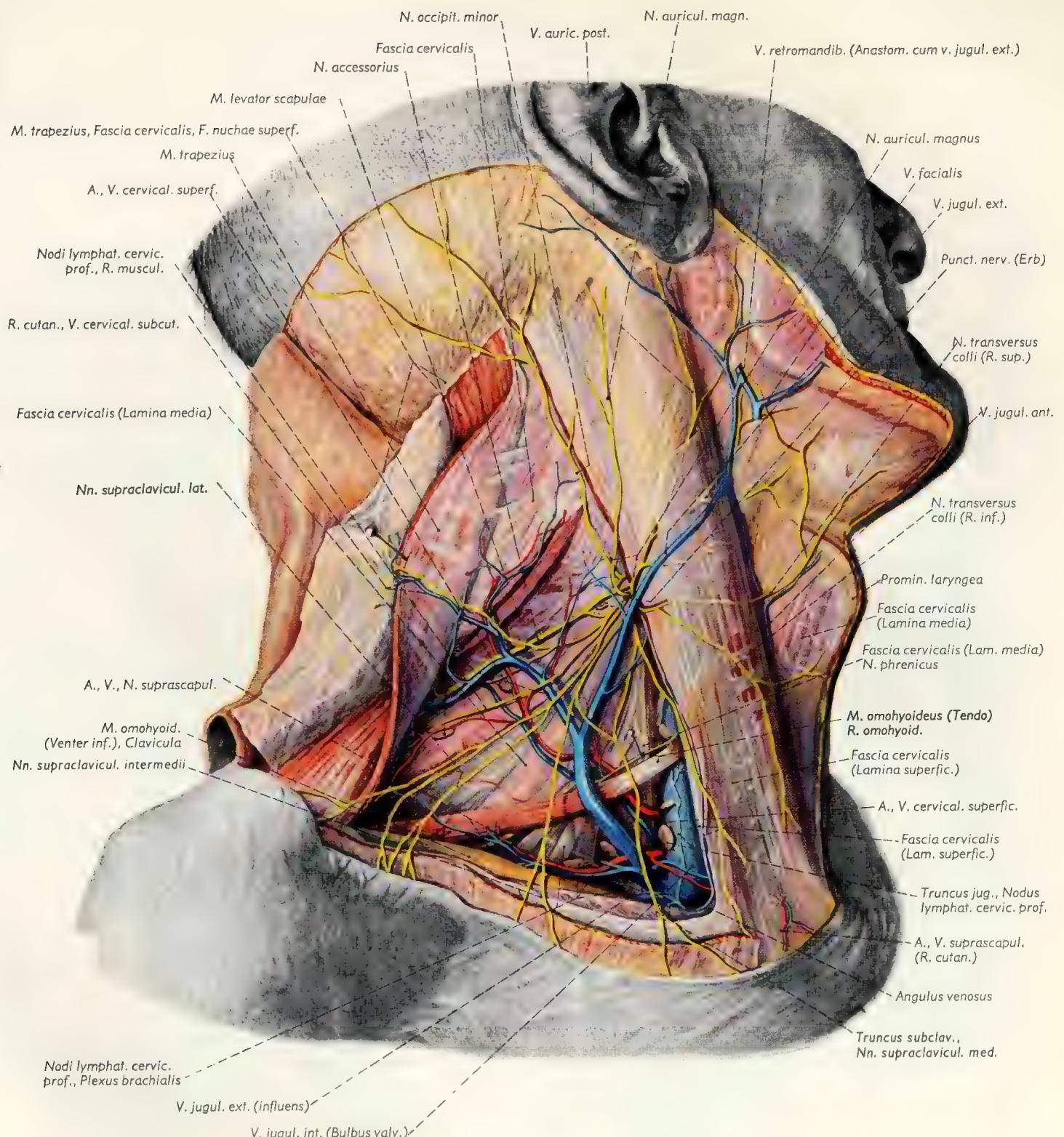


Fig. 282. Blood vessels and nerves in the lateral neck region, particularly in the supraclavicular area.
The lateral cervical fascial compartment has been opened.

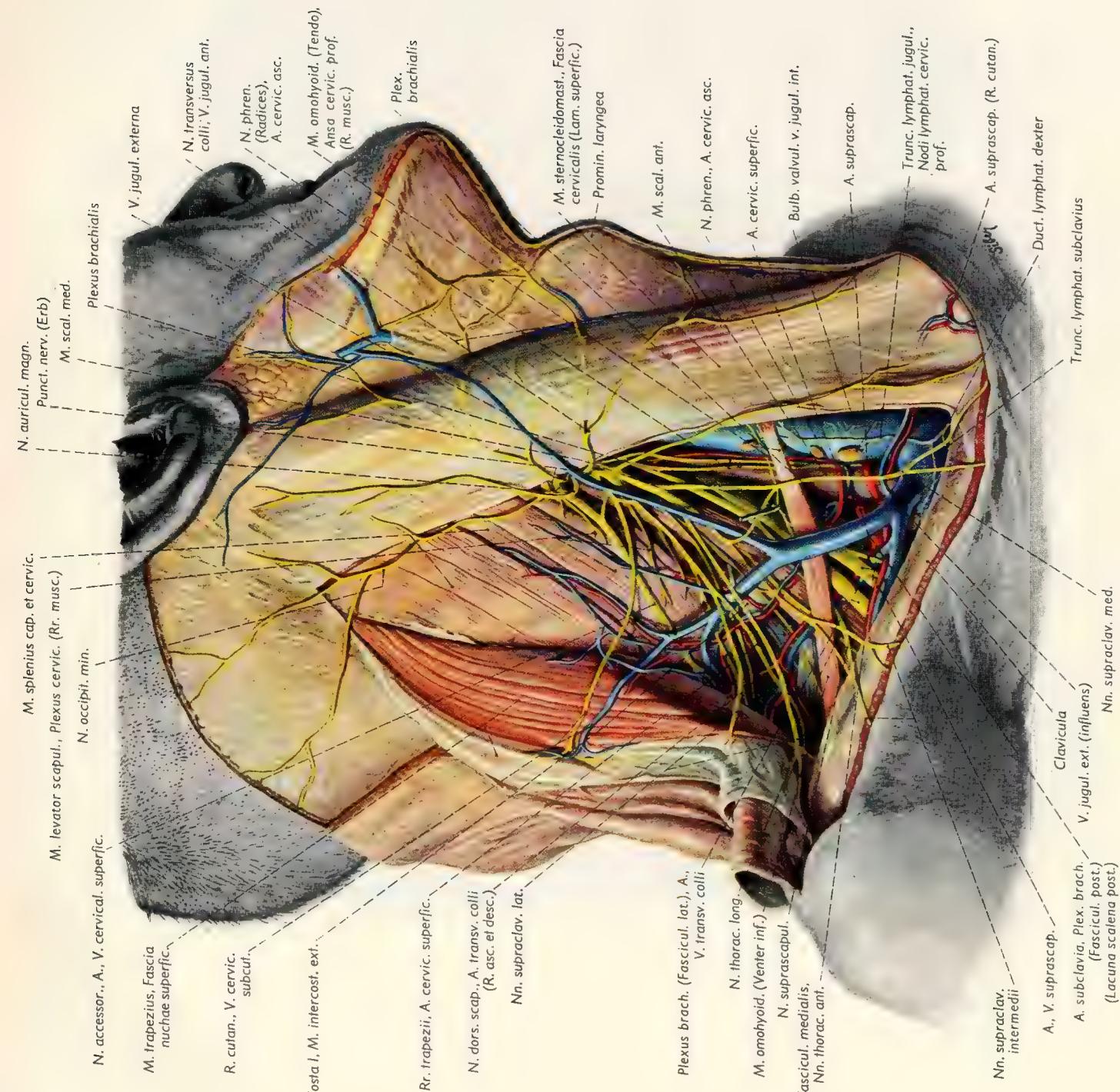


Fig. 283. Blood vessels, nerves, and muscles in the posterior triangle of the neck.
The brachial plexus and subclavian artery are seen in the space between the anterior and middle scalenes.

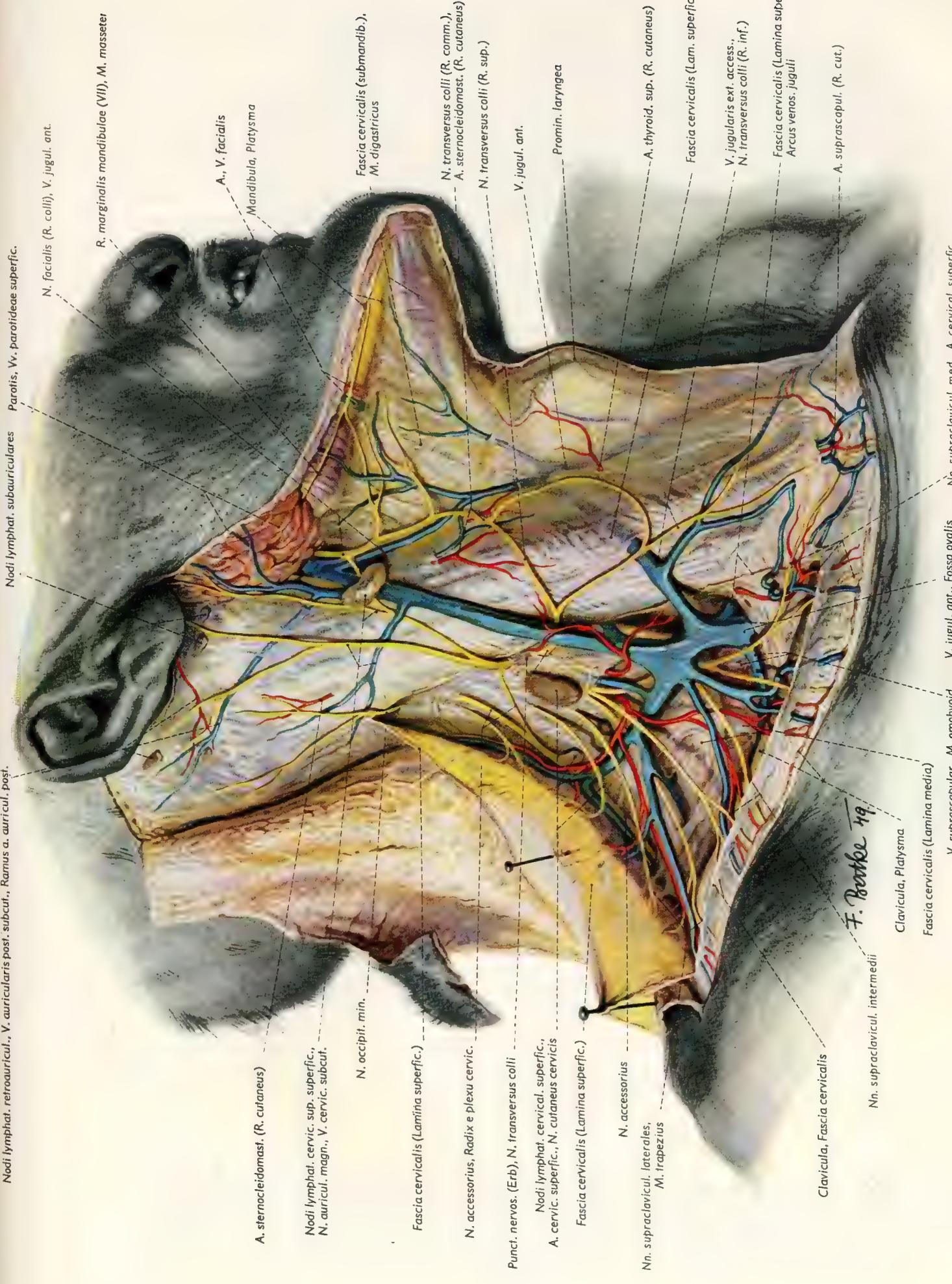


Fig. 284. Ventrolateral aspect of the neck after removal of skin and platysma showing nerves and blood vessels in the suprACLAVICULAR region. The fascial compartment between the middle and superficial laminae of the cervical fascia has been opened by reflecting the latter.

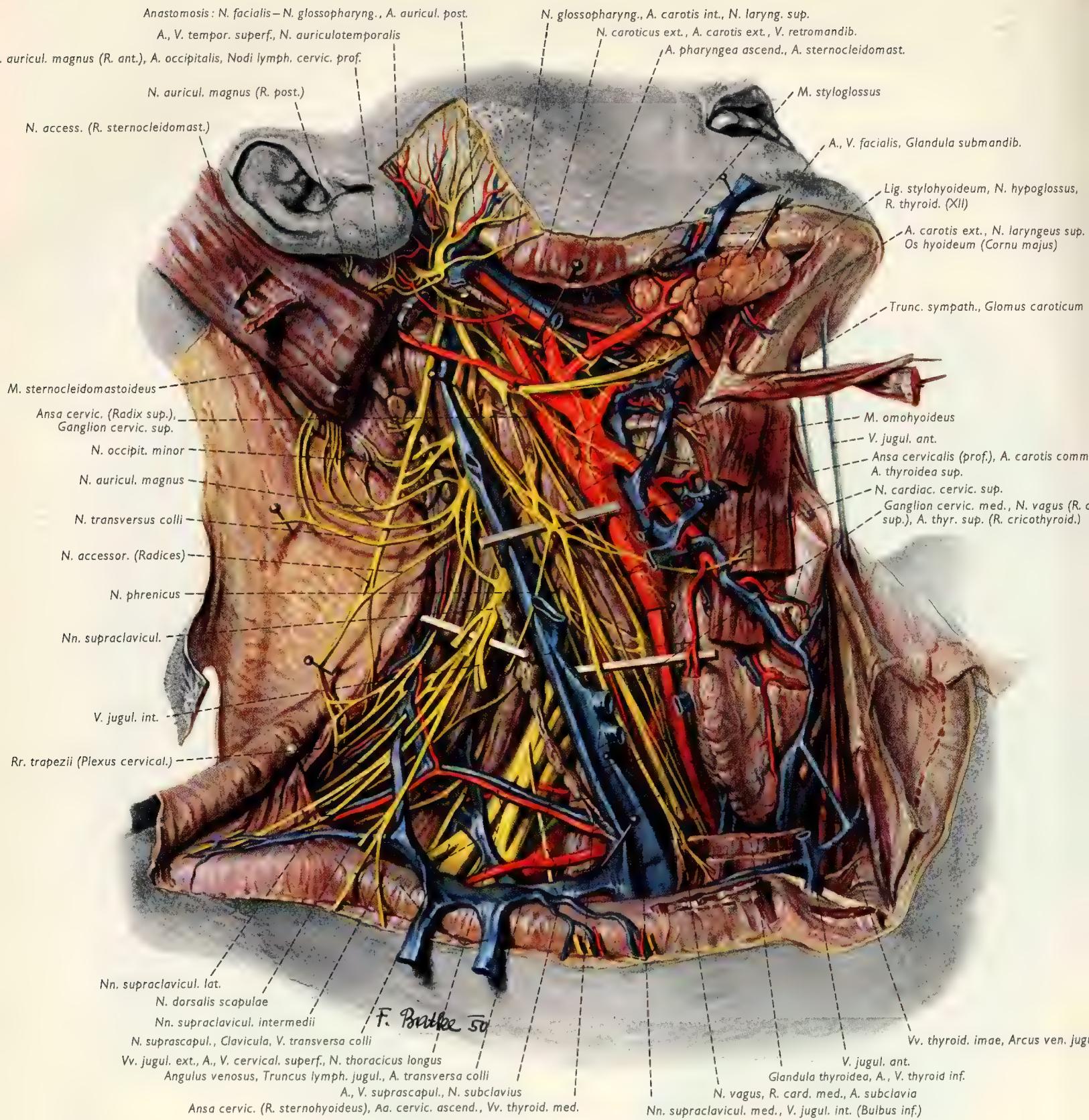
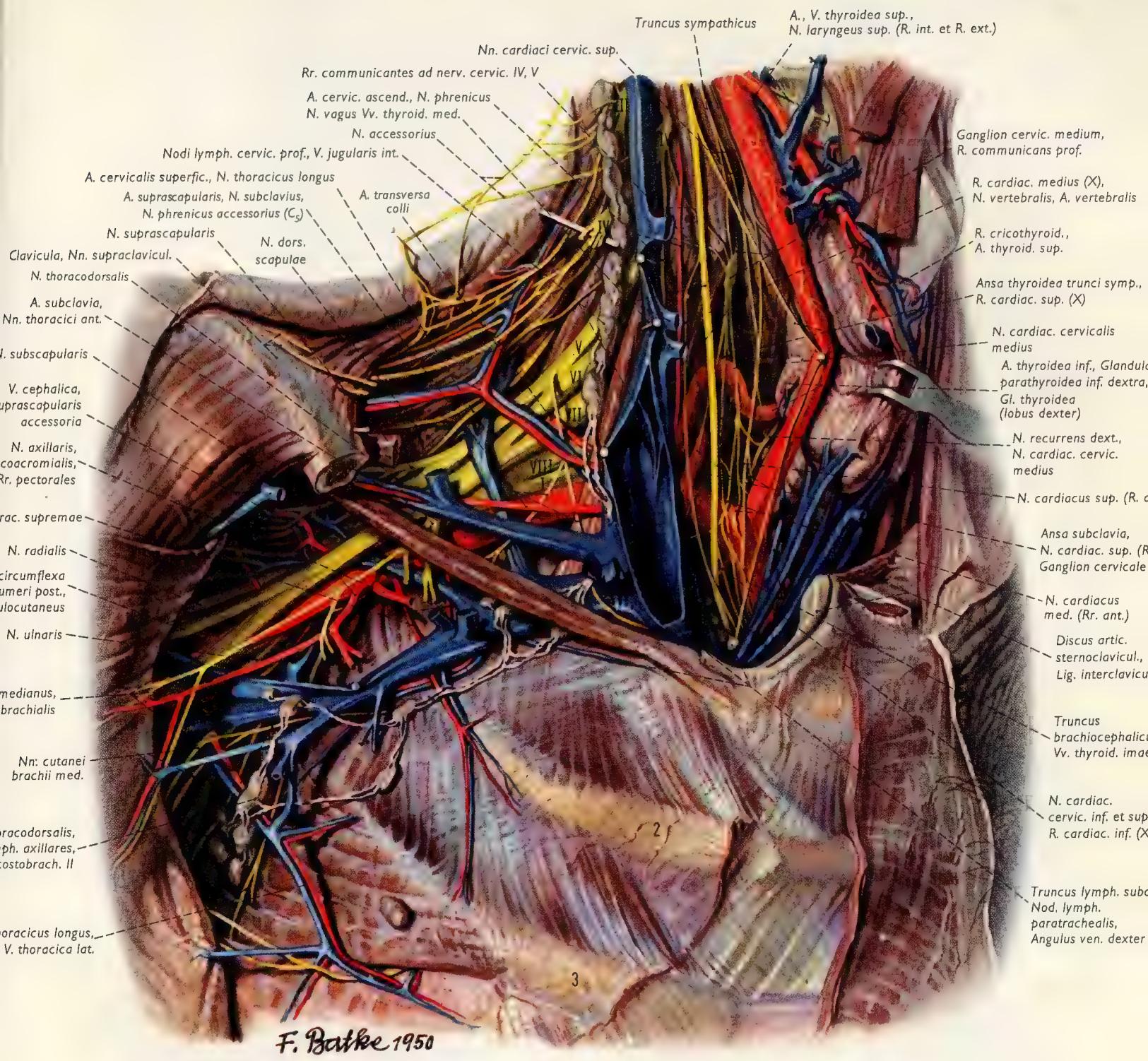
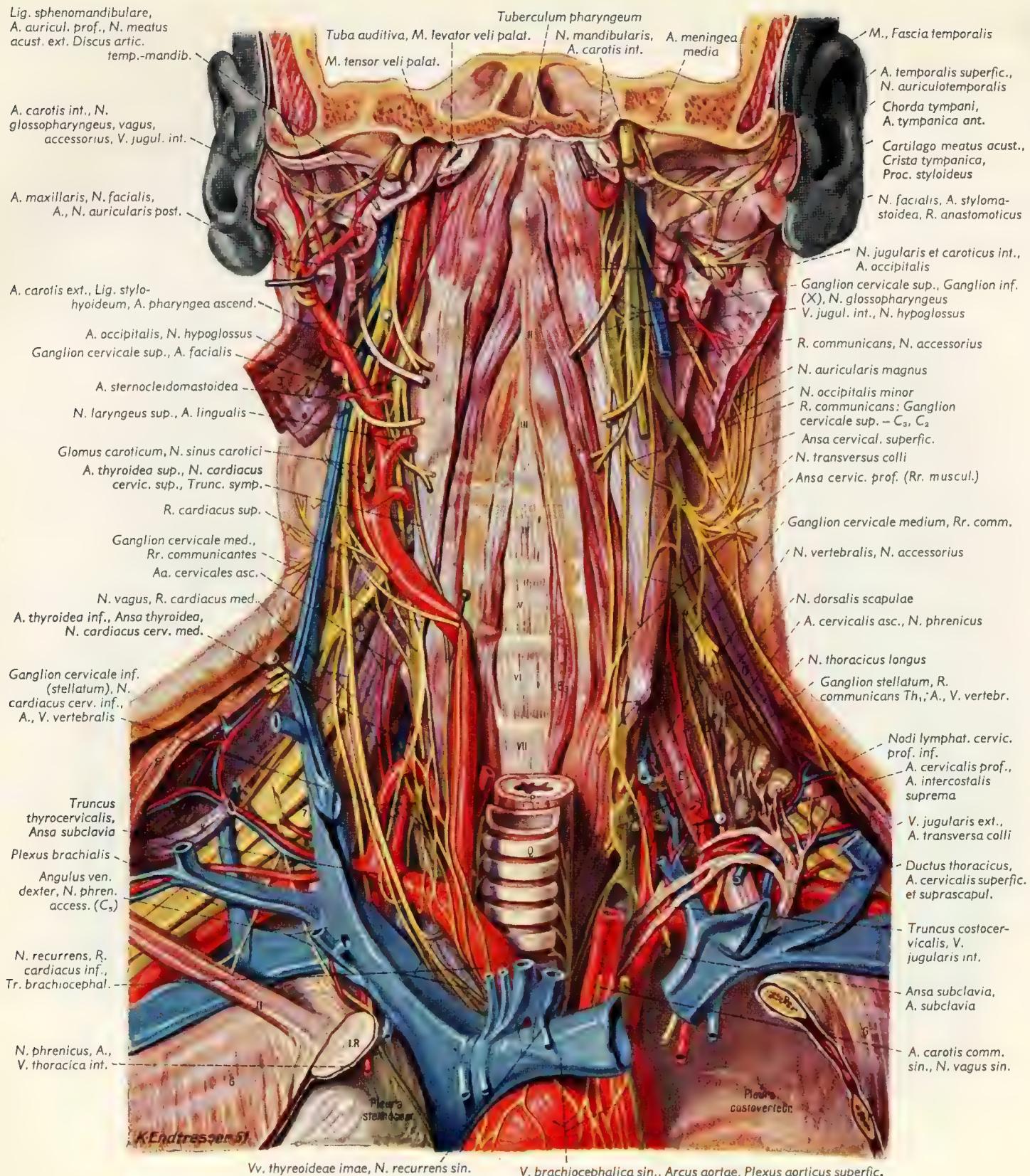


Fig. 285. Deep structures on the lateral aspect of the neck. Dissection of the sternocleidomastoid region and the infrathyroid area of the anterior neck region. Demonstration of the continuity of structures in the sternocleidomastoid region with those in the lateral neck region, and in the carotid and retromandibular fossae, after partial resection of the sternocleidomastoid muscle, the infrathyroid and posterior group of suprahyoid muscles. The upper cutaneous branches of the cervical plexus are reflected laterally and fixed by pins.



III-VIII = Nervi cervic. 3-8 (Rr. ventrales)
I = Nervus thorac. 1, R. ventralis

Fig. 286. Vessels and nerves in the lower neck region, in the scalenovertebral trigone, in the superior thoracic aperture, in the posterior triangle, and in the axilla. The right lobe of the thyroid gland has been reflected to the left, and the common carotid a. and int. jugular v. have been separated from each other so that the deep structures of the scalenovertebral triangle may be seen: inferior thyroid a., vertebral a. (origin). The bulb of the int. jugular v. has been opened in order to show the valves.

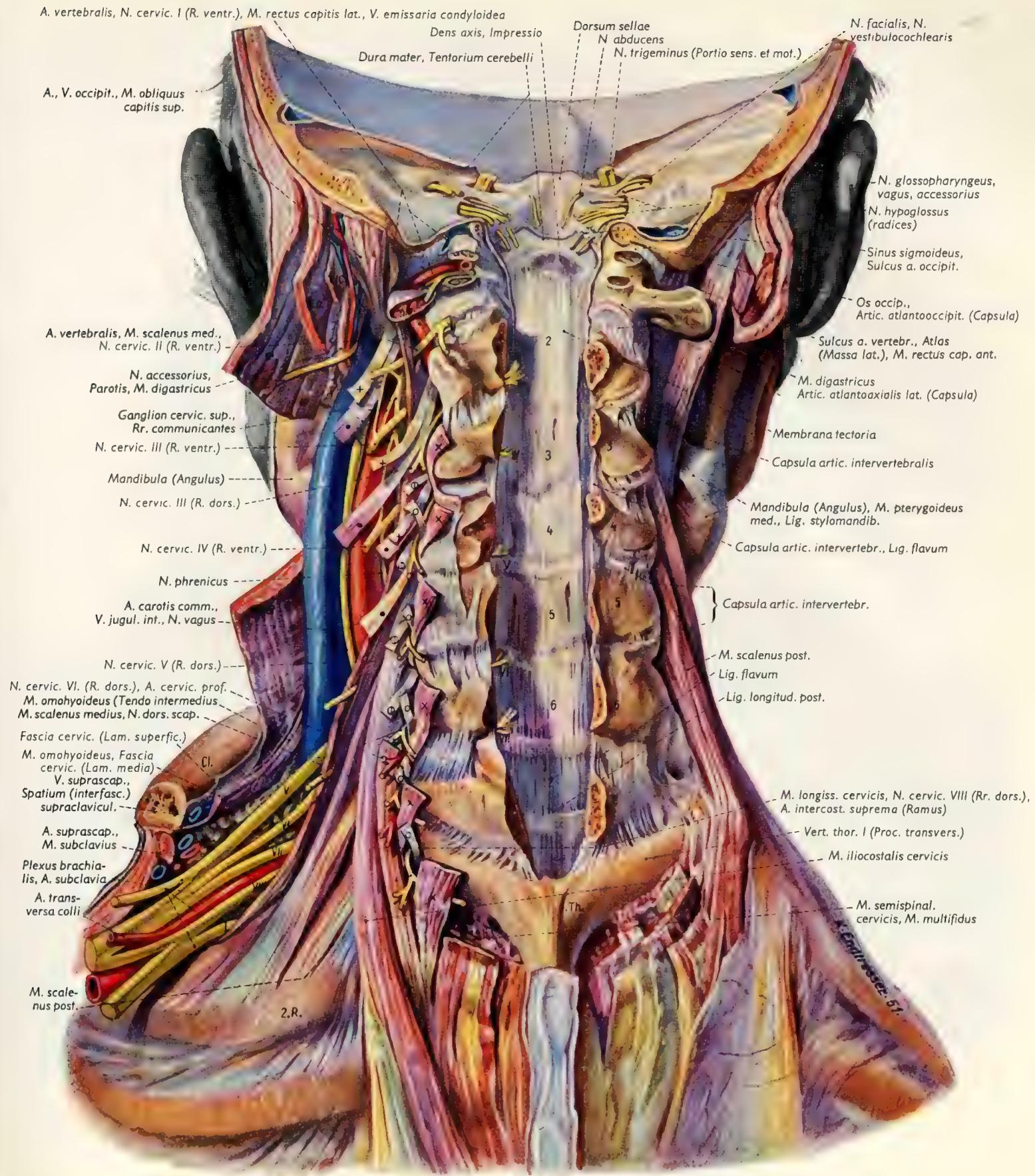


A = M. longus capitis
 B₁, B₂, B₃ = M. longus colli
 C = M. levator scapulae
 D = M. scalenus med.
 E = M. scalenus ventr.
 F = M. trapezius
 G = Mm. intercostales
 H = M. subclavius

J = M. sternocleidomastoid.
 K = M. omohyoideus (Venter caud.)
 L = M. biventer (V. mastoid.)
 M = M. stylopharyngicus (cut);
 N = M. styloglossus (cut);
 O = M. stylohyoideus (cut);
 P = Oesophagus (P. thorac.);
 Q = Trachea (P. thorac.).

2-8 = ventral rami of cervical
 nerves 2-8
 + = costotransv. proc. of
 7th cervical vertebra
 ○ = 1st rib (neck)

Fig. 287. Cervical and axillary neurovascular bundle from front. Blood vessels and nerves in the region of the superior thoracic aperture.



Cl = Clavica;

Oa = M. obliquus atlantis (cut);

Lc = M. longissimus capitis (cut);

Sc = M. splenius capitis (cut);

St = M. sternocleidomastoideus (cut);

+ • = Slips of attachments of splenius cervicis m.

• = Slips of origin of levator scapulae m.

× = Slips of origin of transversooccipital m.

○ = Slips of origin of longissimus capitis m.

○ = Slips of attachments of longissimus cervicis m.

I-VIII = roots (trunks)
and ventral rami of the
8 cerv. nerves

Fig. 288. Cervical vertebral canal opened from behind with the contents removed.

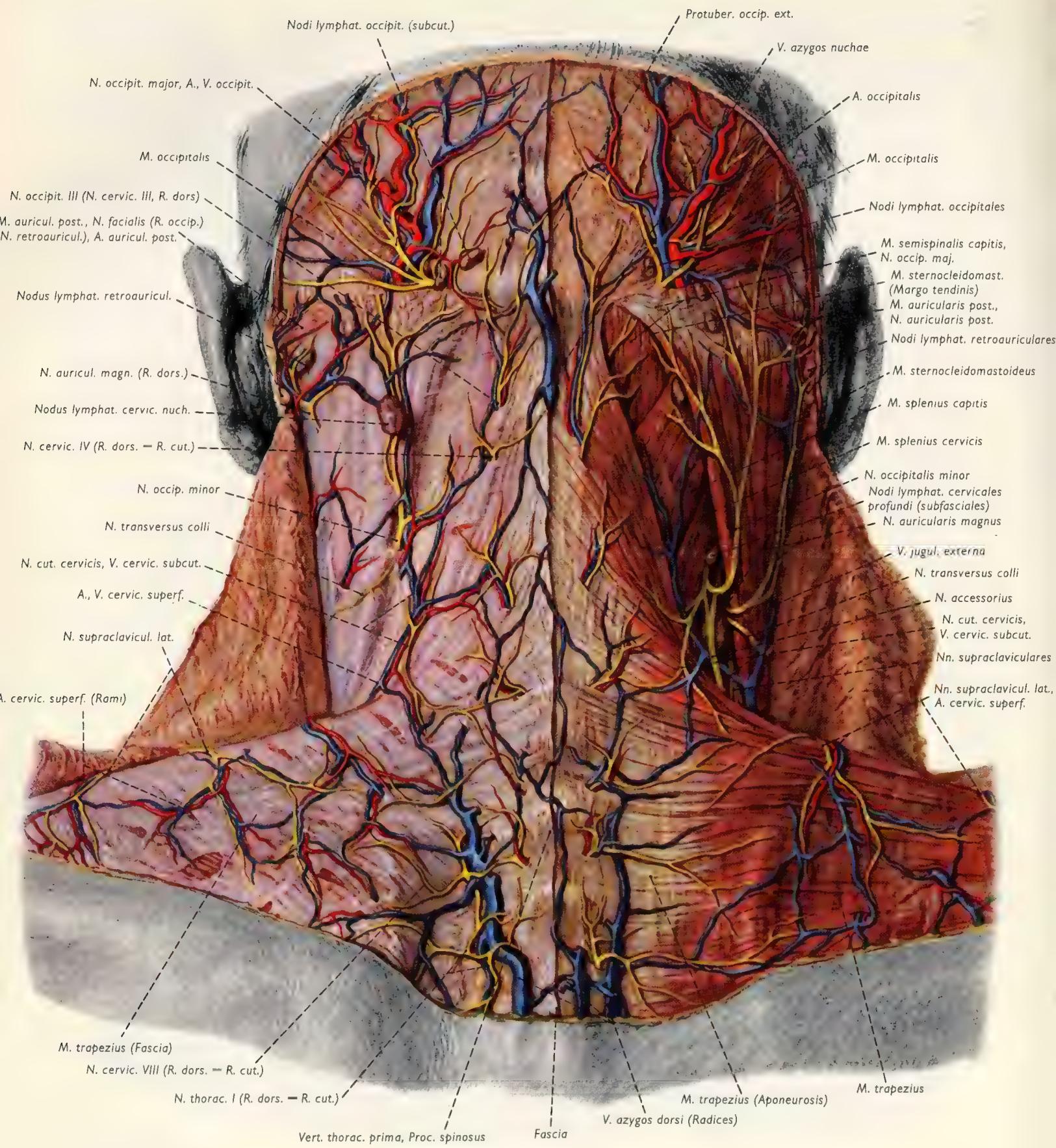


Fig. 289. Superficial layer of the posterior neck and occipital regions. Left: subcutaneous structures and superficial lamina of the cervical fascia. Right: superficial muscles and overlying vessels and nerves, particularly in the occipital trigone.

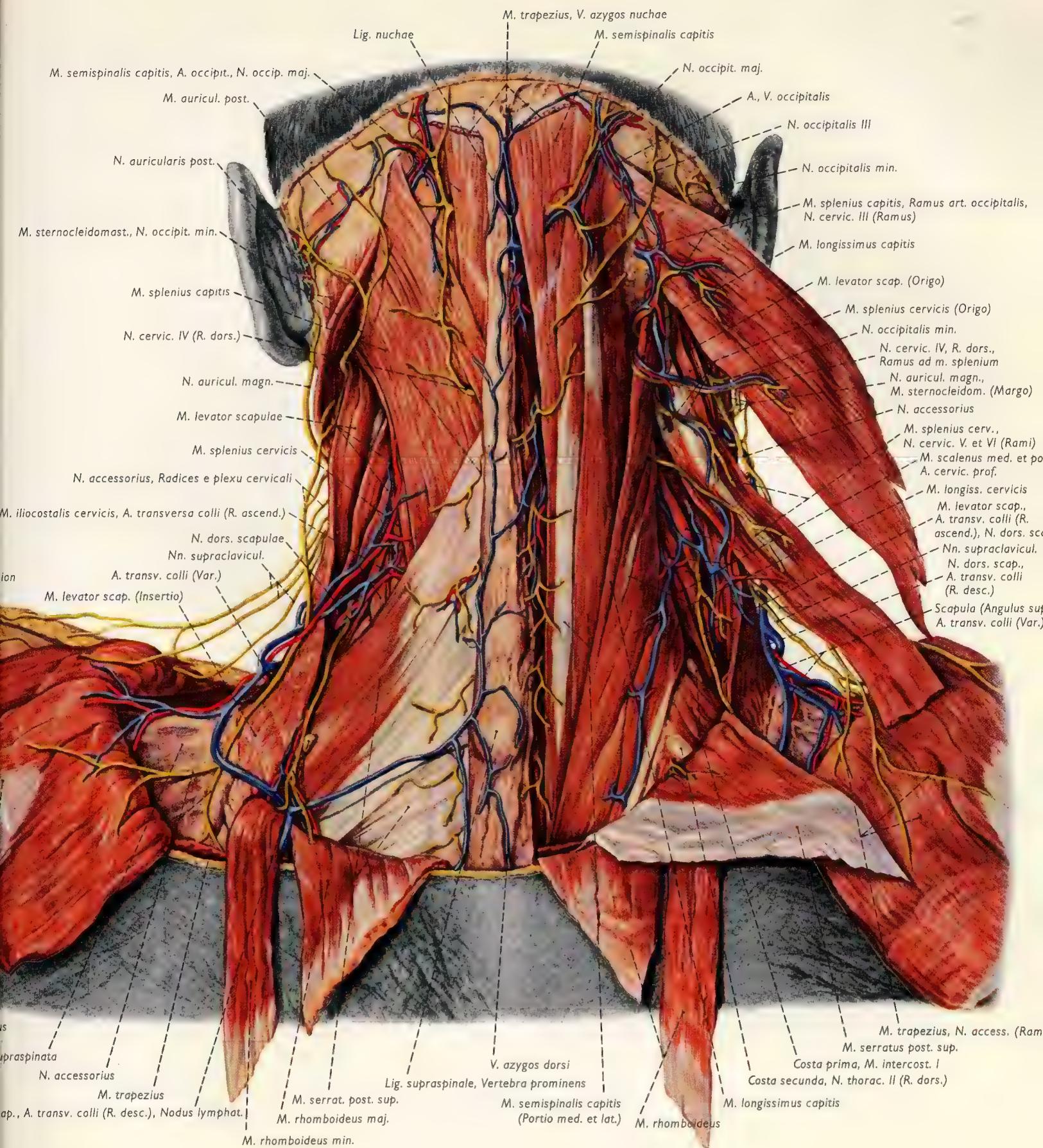
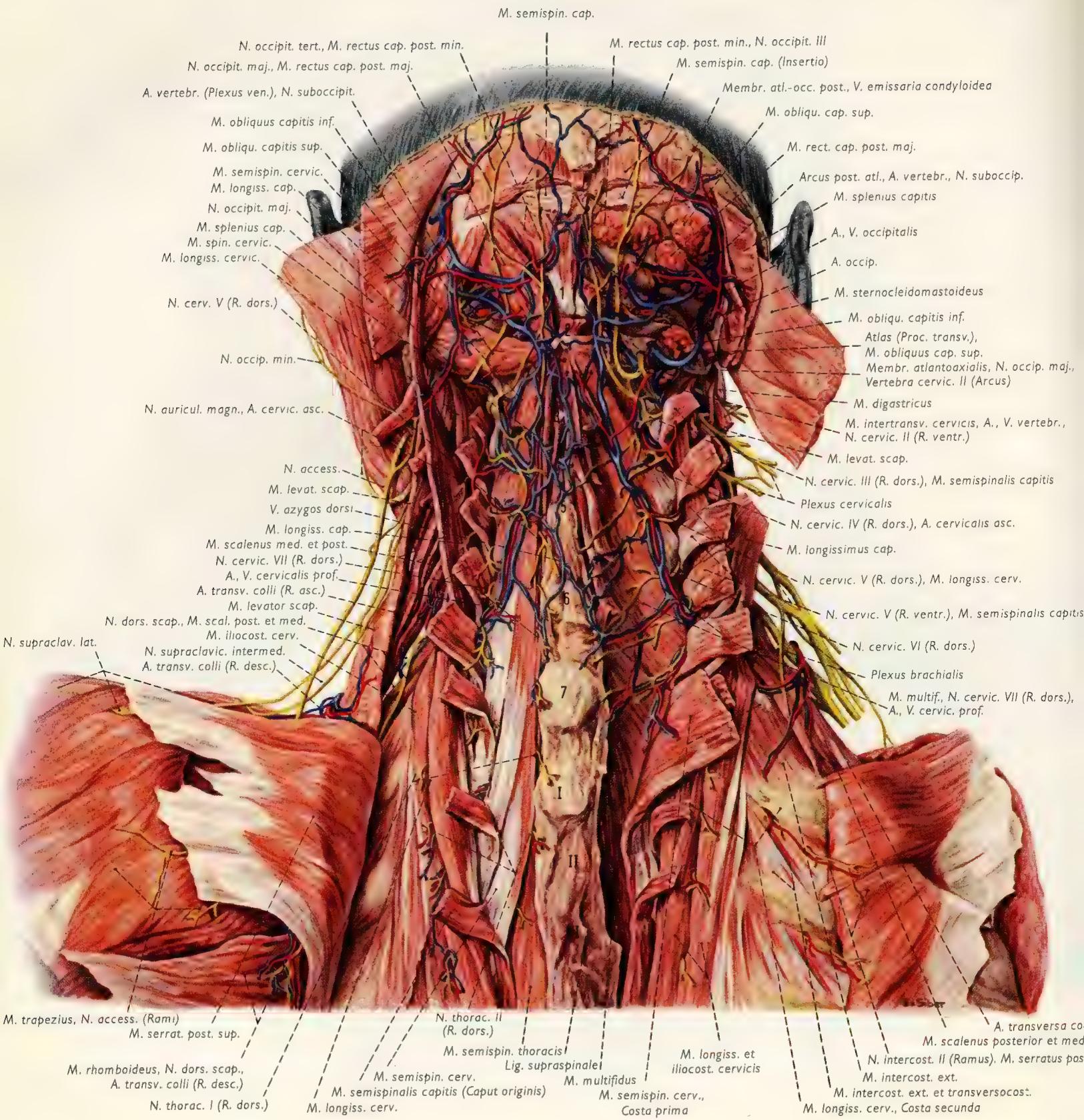


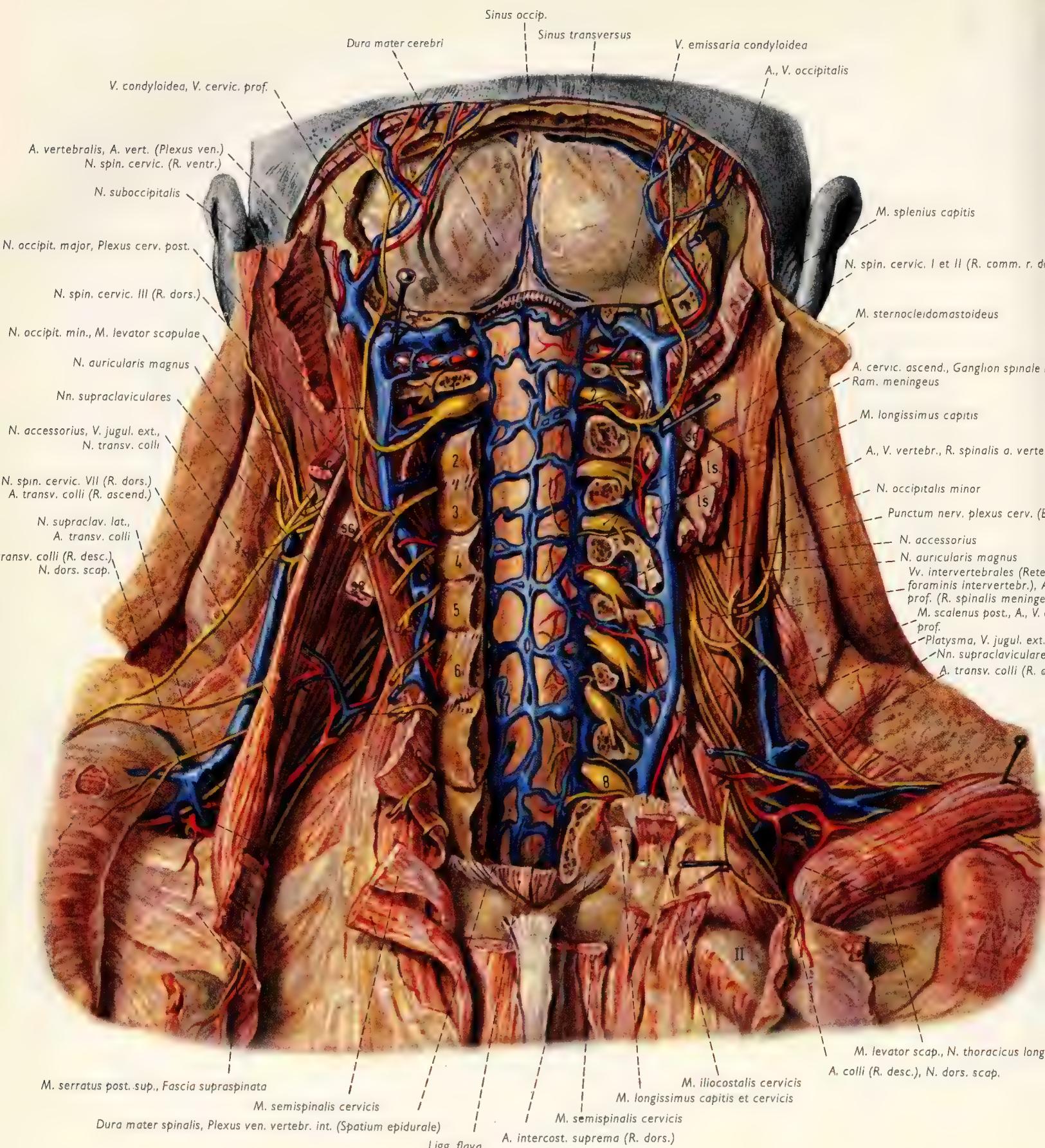
Fig. 290. Continued dissection of posterior neck region: exposure of the intrinsic muscles of the posterior neck and the overlying vessels and nerves after reflection of the superficial muscles (the trapezius, rhomboid, and post. sup. serratus muscles), particularly the splenius muscle. On the right side: exposure of the semispinalis capitis, longissimus capitis and cervicis, and the iliocostalis cervicis muscles after reflection of the splenius muscle.



1–7 = spinous processes of the 7 cervical vertebrae
I–III = spinous processes of the upper 3 thoracic vertebrae

Fig. 291. Deep posterior neck region with blood vessels and nerves. Dissection of the deep (intrinsic) muscle layers down to the skeletal level. Left: exposure of the longissimus capitis and cervicis muscles, and the iliocostalis cervicis as well as the semispinalis cervicis, and the small muscles of the suboccipital triangle, after reflection of the semispinalis capitis. Right: dissection of the deepest layer, the multifidus muscles.

The Vertebral Canal and the Spinal Cord



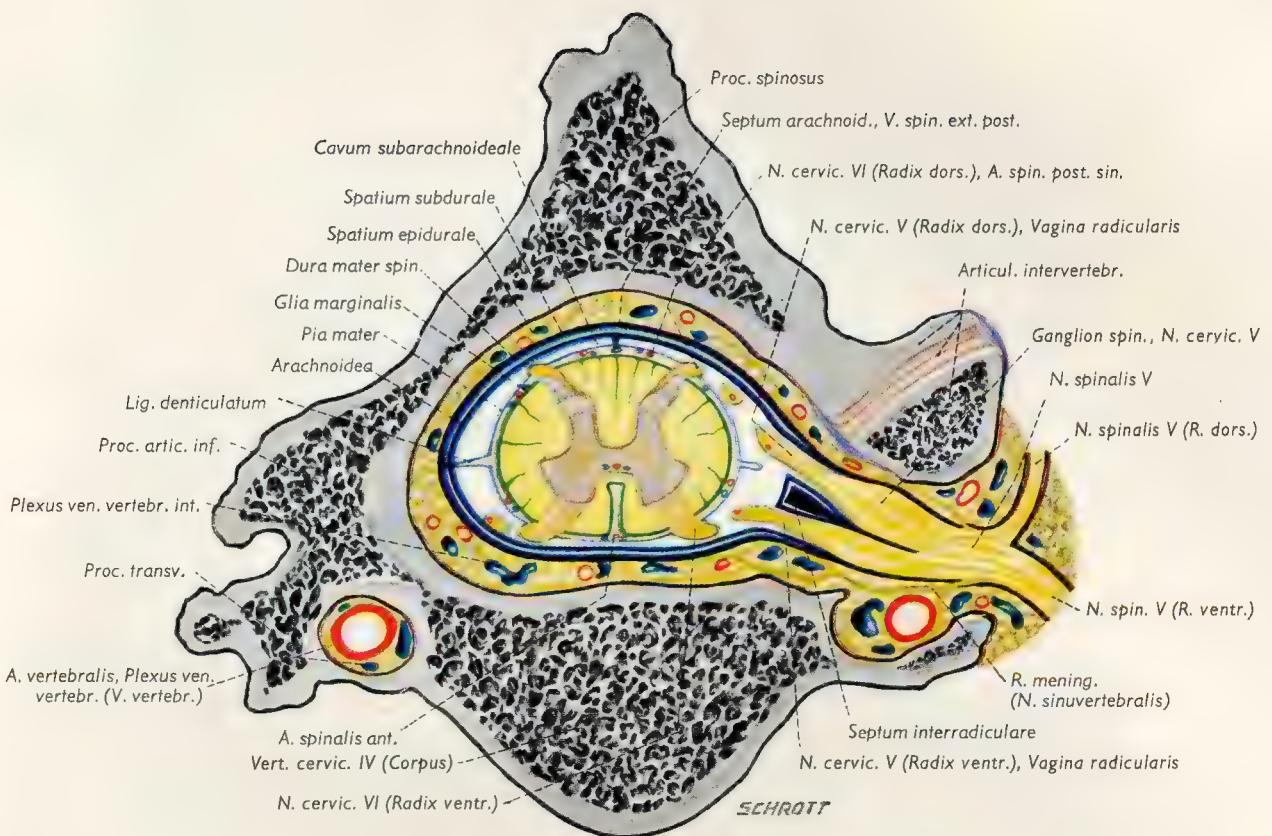
ic = M. semispinalis capitis
lc = M. longissimus capitis

ls = M. levator scapulae
sc = M. splenius cervicis

1-7 left = posterior cut surfaces of the arches of cervical vertebrae 1-7

2,8. right = spinal ganglia of 2nd and 8th cervical nerves
I,II = right 1st and 2nd ribs

Fig. 292. Opened cervical part of the vertebral canal and the posterior cranial fossa from behind. Dissection of extradural structures, and the spinal and cranial dura mater. The laminectomy was performed in such a manner that the vertebral arches were sawed through behind the articular processes on the left side, and in front of the same on the right side. The right intervertebral foramina have been opened so that the roots and ganglia of the cervical nerves may be seen. The scalene muscles are retained on both sides, and the branching of the cervical plexus is brought into view.



Thick black line = spinal dura mater

Fine black line = arachnoid, periosteum

Light gray = pia mater

Green = marginal glia

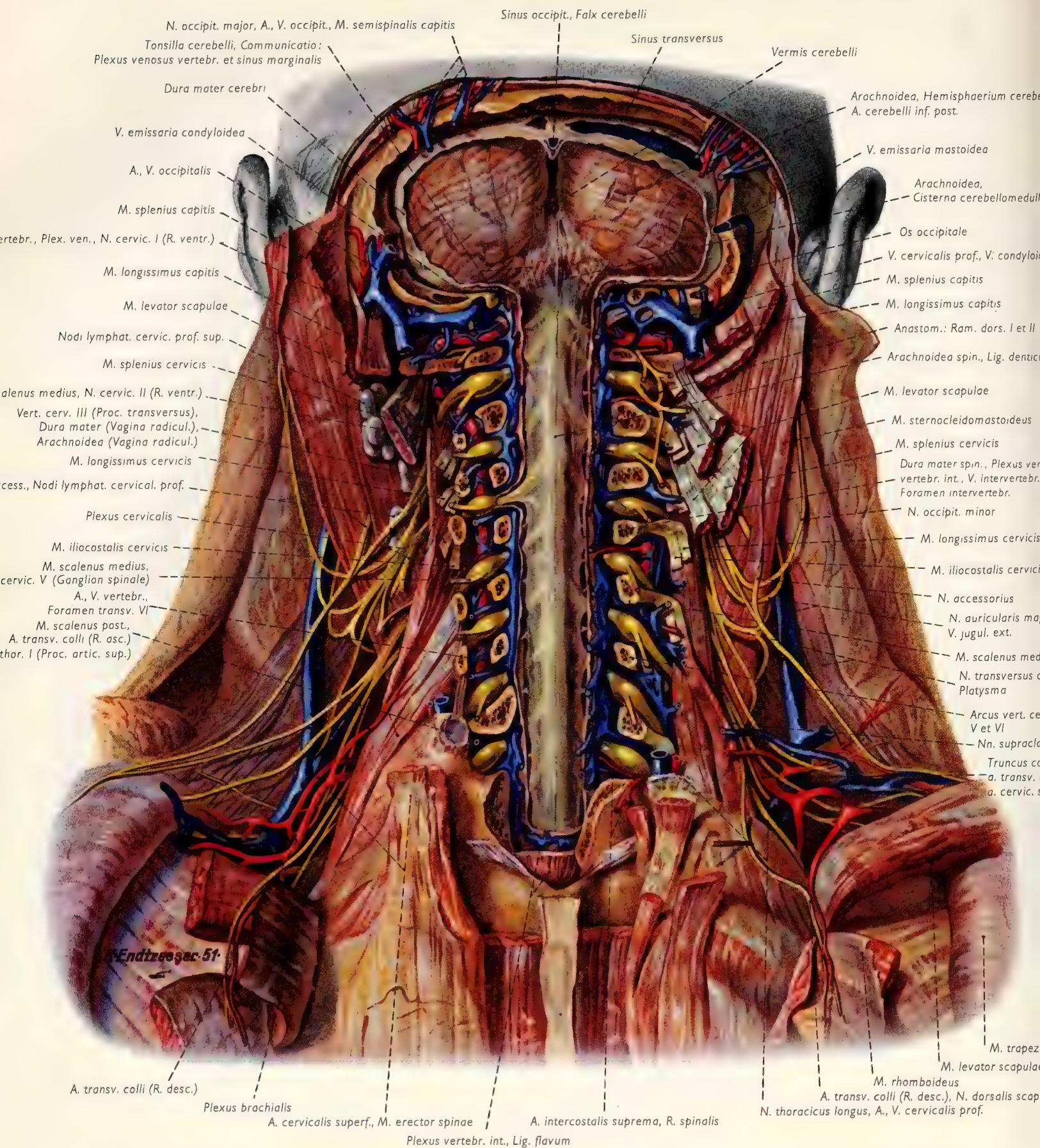
Yellow = white matter of spinal cord,
and nerves

Light gray = gray matter of the
spinal cord

Violet = ligaments and joint capsule

Brown = articular cartilage

Fig. 293. Transverse section through the cervical vertebral column and the contents of the vertebral canal: the spinal cord and its investing membranes in cross section. Section through the body of the 4th cervical vertebra; on the right at the level of the transverse process, on the left somewhat deeper. On the left side the cut passes through the enclosed transverse foramen with the vertebral a. and v.



1-7 = cut roots of arches of cervical vertebrae 1-7

Fig. 294. Opened cervical vertebral canal and posterior cranial fossa seen from behind. The arachnoid sac, roots, and branches of the cervical spinal nerves are exposed by opening the intervertebral foramina. The internal vertebral venous plexus and its external connections as well as the vertebral a. are illustrated. The cervical plexus and its branches are seen from behind.

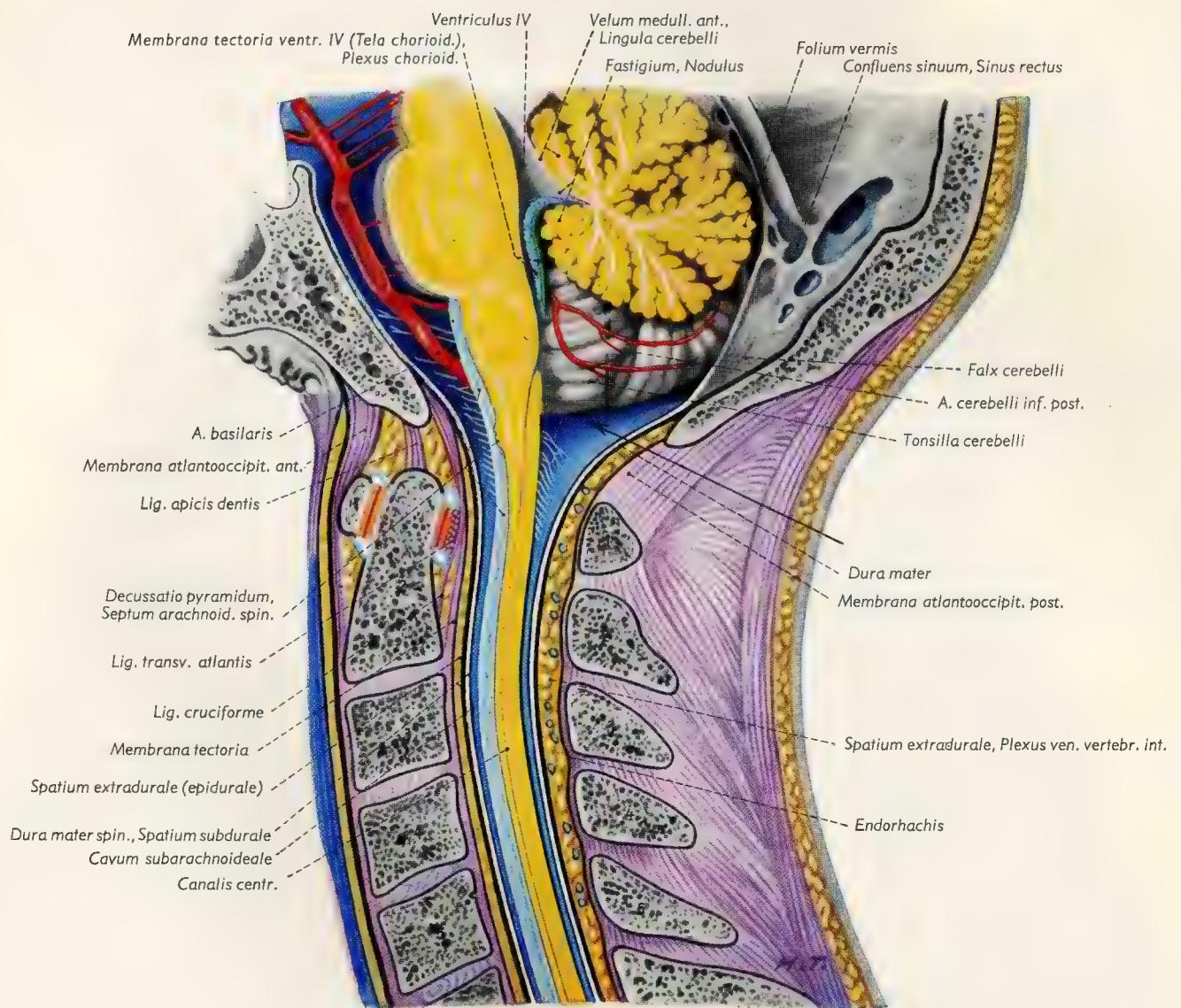
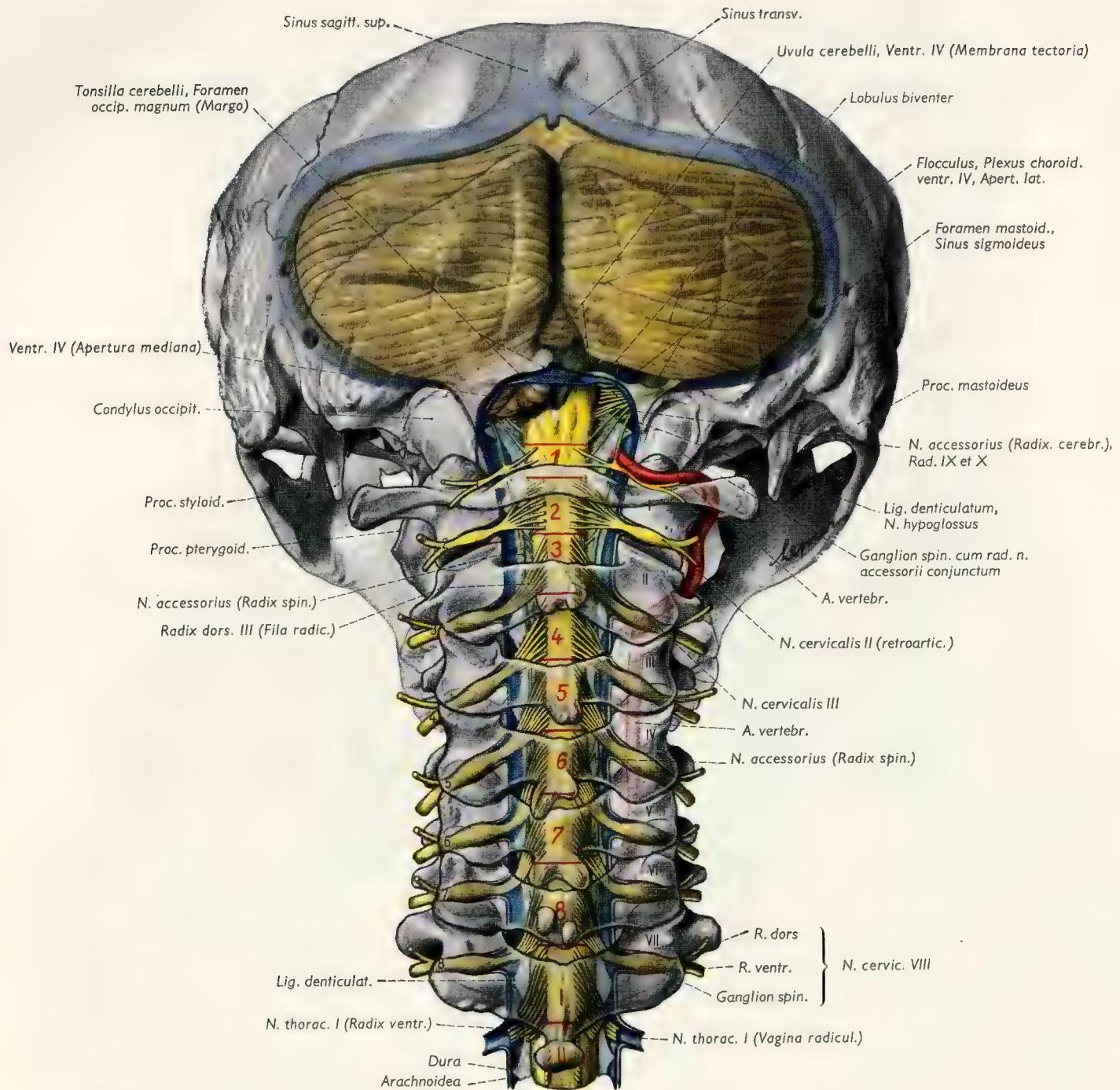
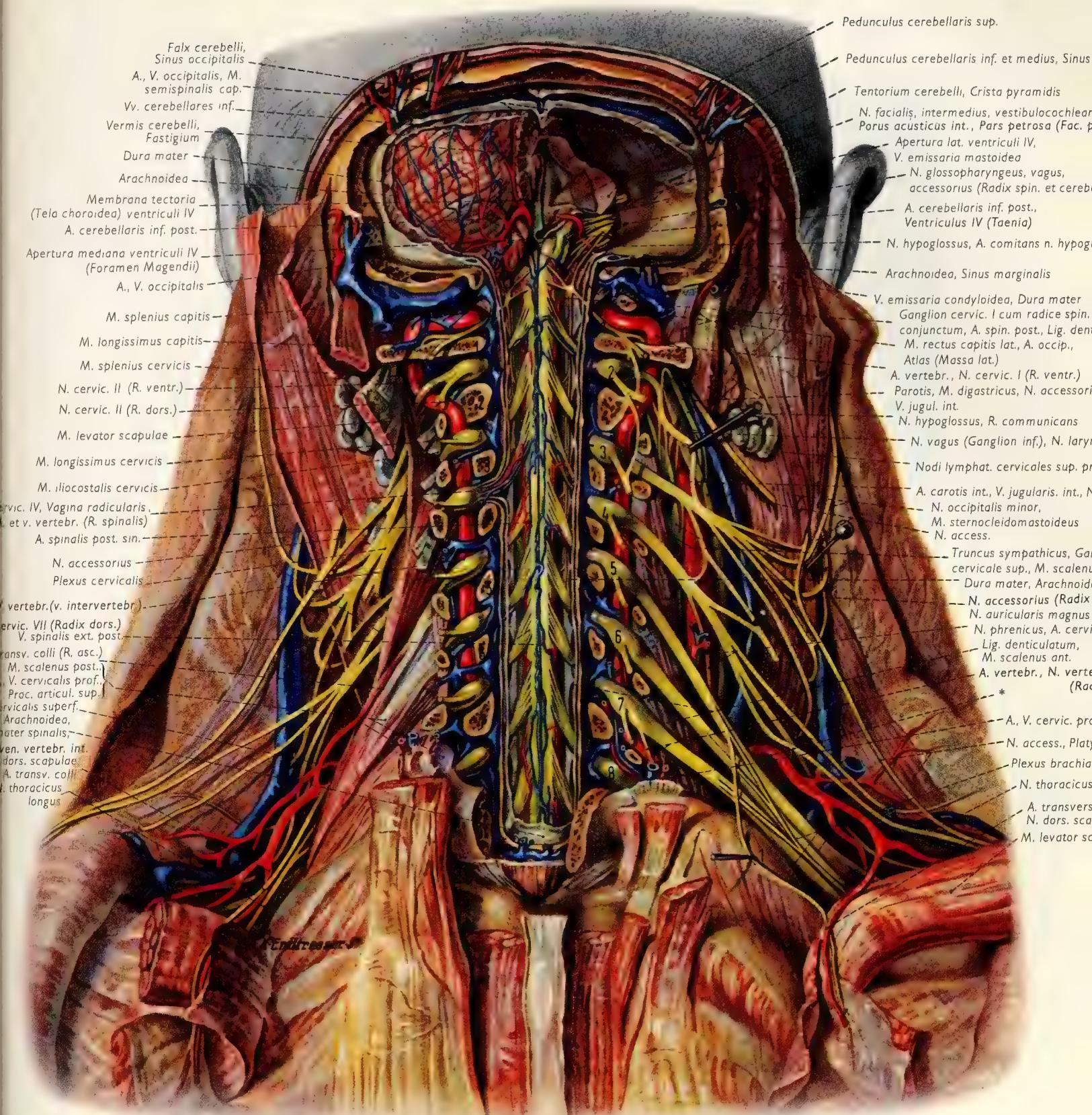


Fig. 295. Contents of the cervical vertebral canal and the adjacent portion of the cranial cavity in a median section. Cut surfaces of the cervical cord, brainstem, and cerebellum are colored yellow. The arrow indicates the position of the needle when doing a cisternal puncture; the tip of the needle is in the cerebellomedullary cistern and points approximately toward the median aperture of the 4th ventricle.



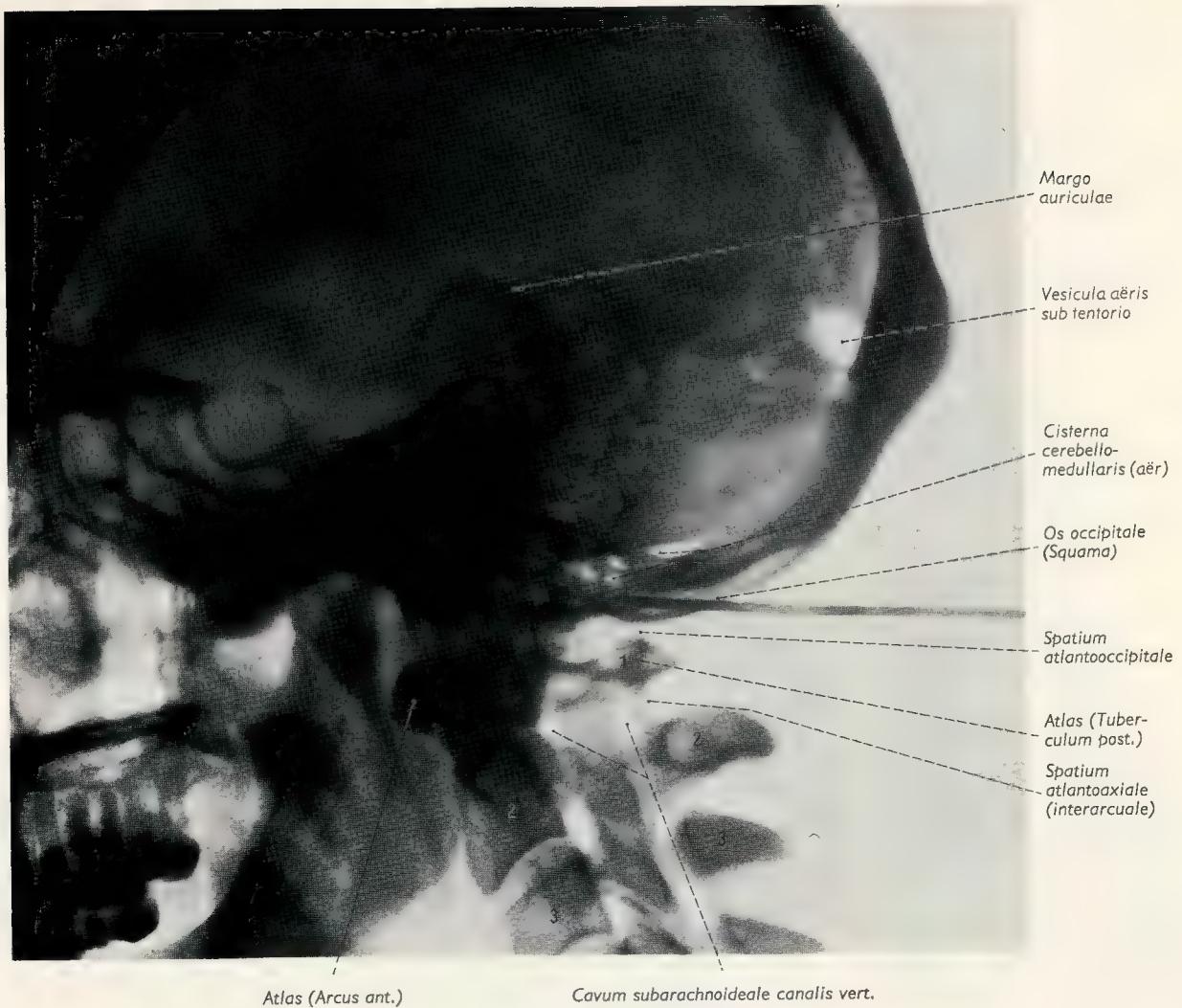
1–8 red = cervical segments 1–8
 1–8 black = cervical nerves 1–8
 I–VII = cervical vertebrae 1–7
 I,II red = thoracic segments 1 and 2

Fig. 296. The cervical portion of the spinal cord in situ within the vertebral canal with the associated parts of the brain, in a sagittal projection, and viewed from behind. The posterior wall of the vertebral canal and the cranial cavity are drawn translucent. The dural sac (black) and the arachnoidal sac (blue) appear as if cut in a frontal plane so that the spinal cord and the dorsal roots of the cervical nerves and the adjacent cranial nerves can be seen in this projection. The course of the vertebral a. is indicated.



* = V. jugul. ext., Nn. supraclavicul., Truncus comm. a. transv. colli and a. cervic. superfic.
 2-8 right = spinal ganglia of cervical nerves 2-8
 1-7 left = cut surfaces of the roots of the arches of cervical vertebrae 1-7

Fig. 297. Opened vertebral canal and posterior cranial fossa from behind. The dura and arachnoid have been removed in order to show the cervical spinal nerves and their roots, branches, spinal ganglia, the cervical plexus, the entire course of the vertebral a. in the neck, and the vertebral venous plexus. The right hemisphere of the cerebellum has been removed to show the rhomboid fossa, the crura of cerebellum, and the arachnoidal course of VII, VIII, IX, X, and XI.



1–3 = cervical vertebrae 1–3

Fig. 298. Roentgenogram (lateral, right-left) of the cerebellomedullary cistern filled with air. The cannula is introduced suboccipitally into the subarachnoid space (direct method).

Pharynx and the Pharyngeal Region

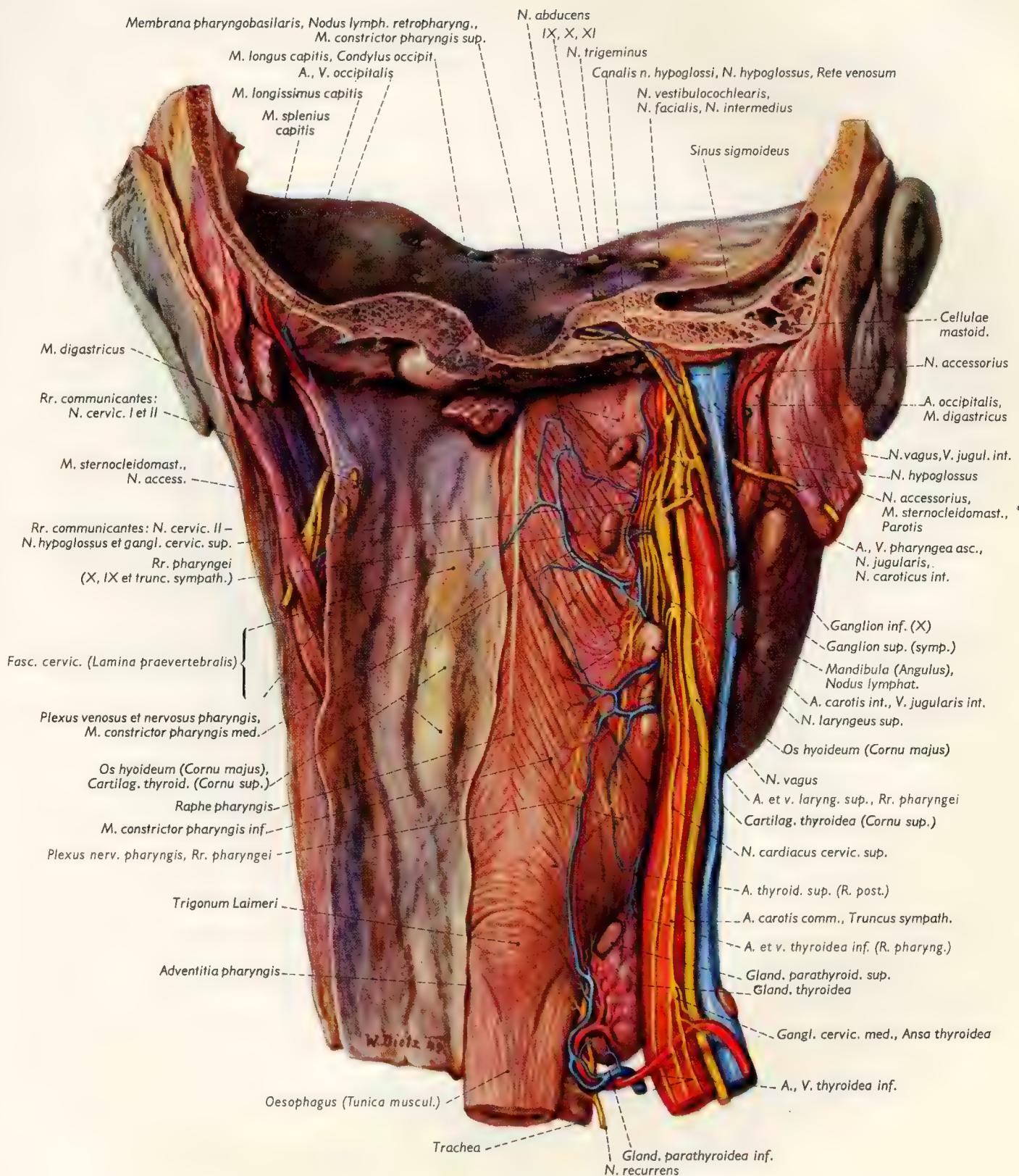


Fig. 299. Dissection of the posterior pharyngeal wall and the neurovascular bundle from behind after removal of the cervical vertebral column.

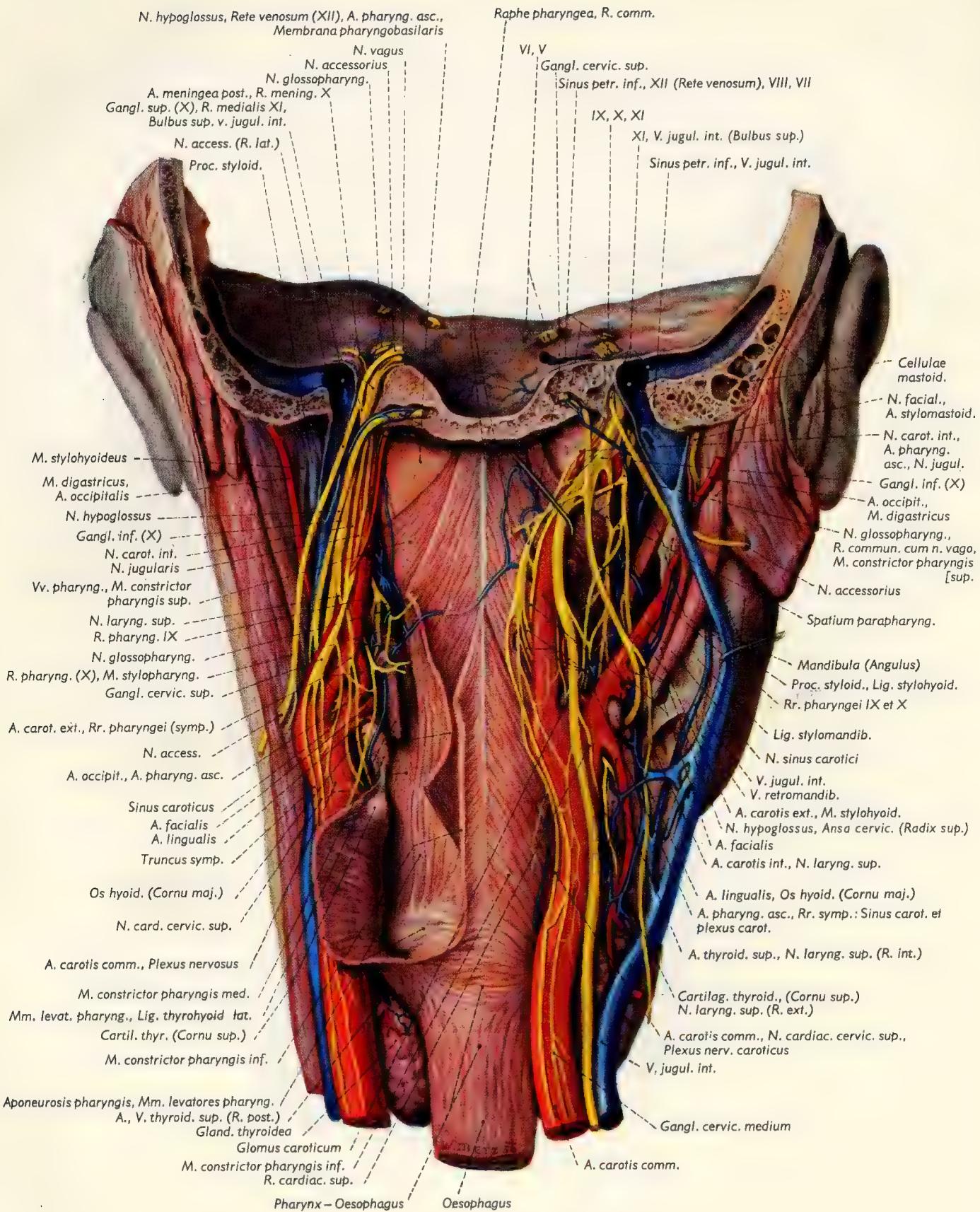


Fig. 300. Dissection of pharynx and the neurovascular bundles up to the cranial base, from behind.
The section passes through the base of the cranium at the level of the jugular foramina.
Vessels and nerves of the pharyngeal space.

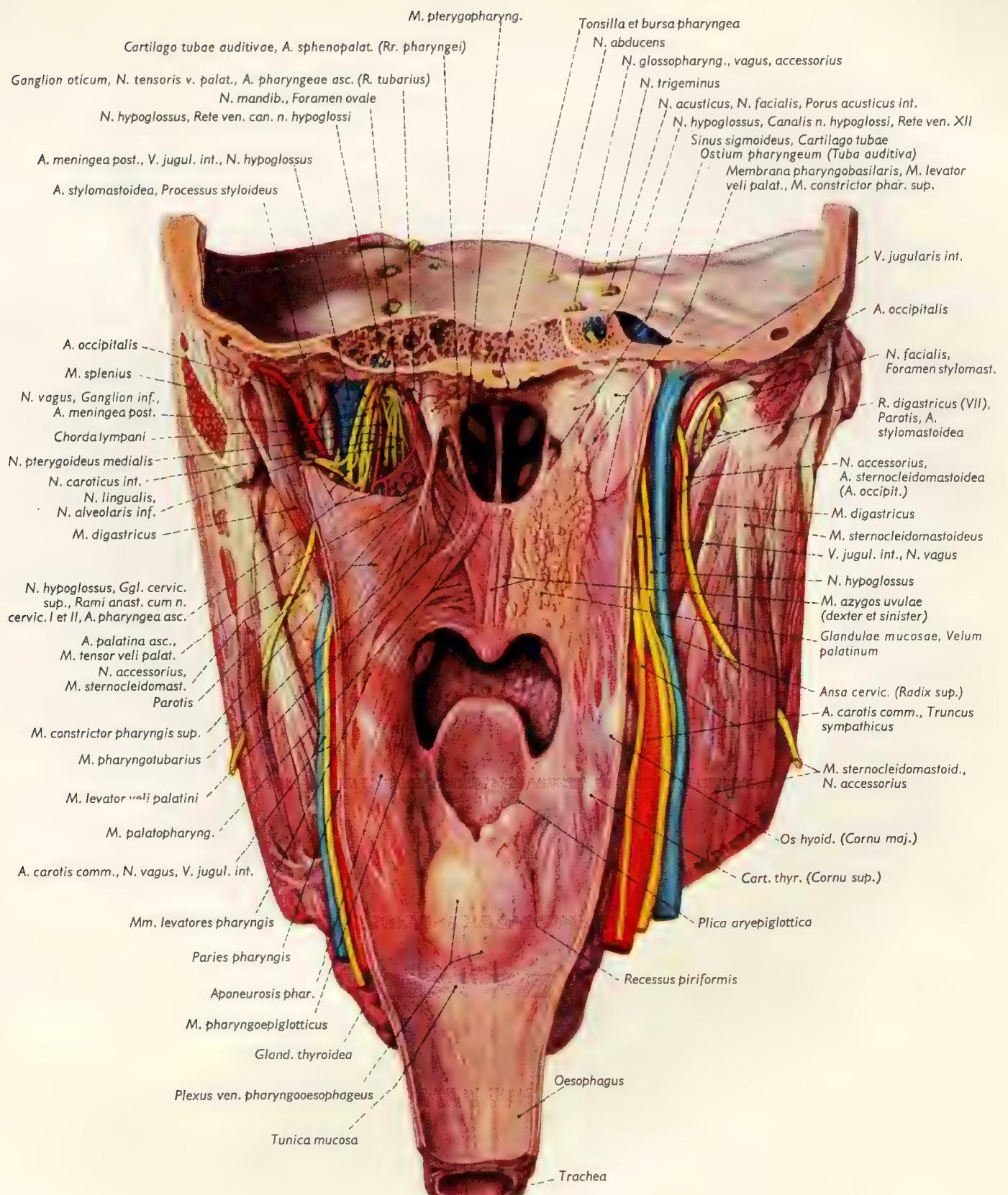


Fig. 301. Pharynx opened from behind, showing on the left the muscle layers of the pharyngeal wall from the inside, as well as the musculature of the soft palate.

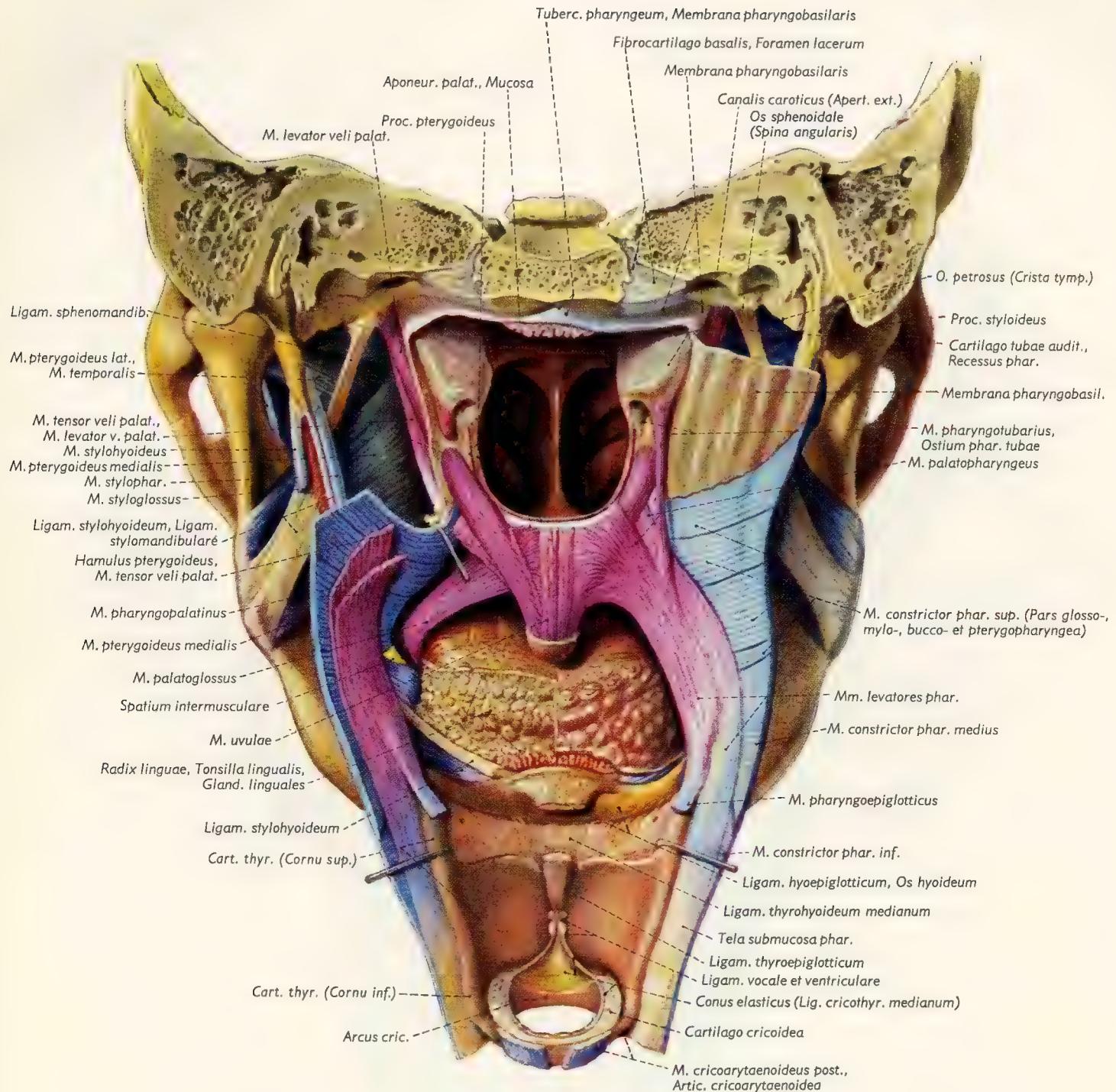


Fig. 302. Muscles of the pharynx and palate seen from behind and inside after removal of the mucosa.

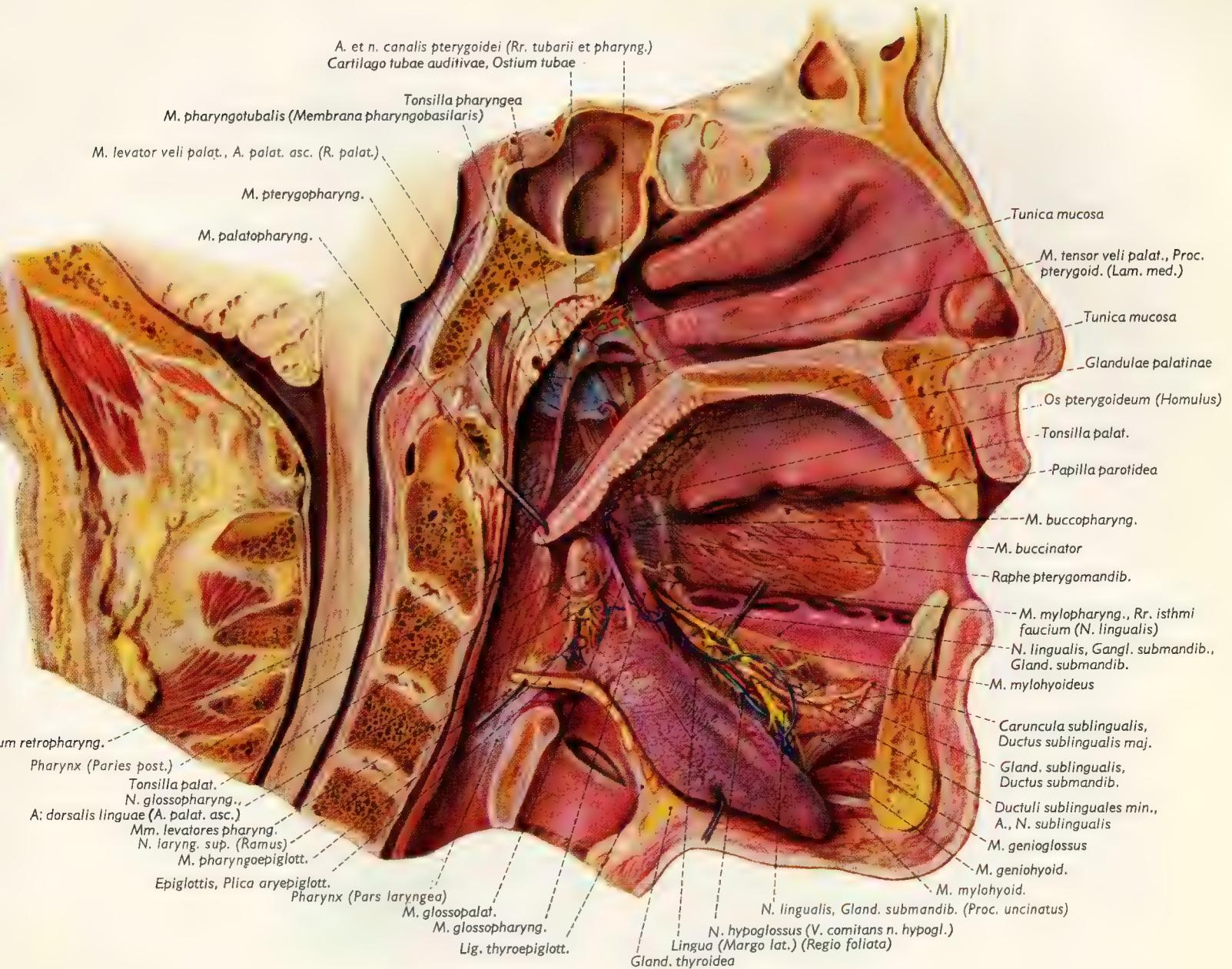
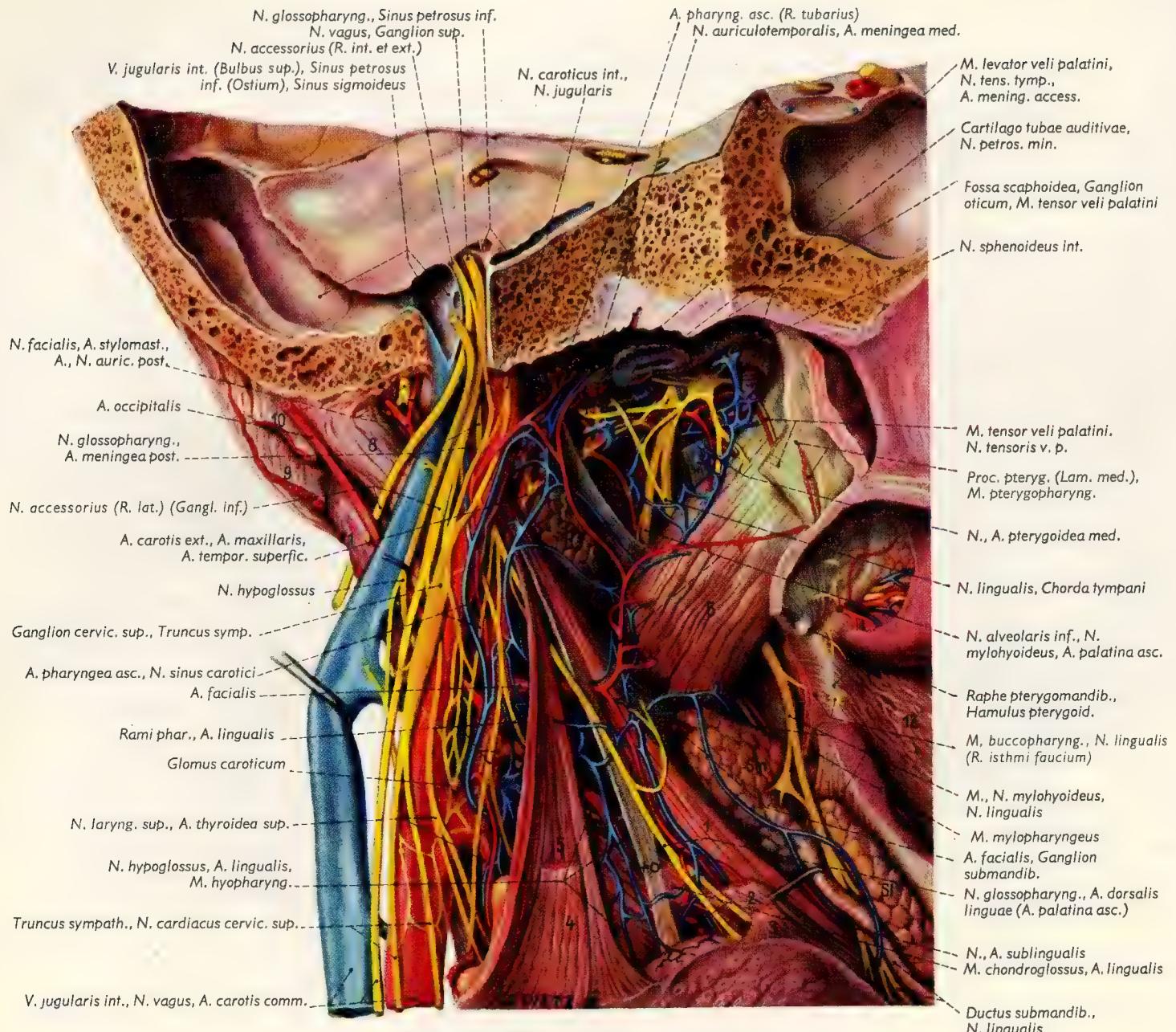


Fig. 303. Median section through the facial skeleton and pharynx. Left half of the section. Dissection of the muscular layer of the pharyngeal wall from the inside, the nerves and vessels at the base of the tongue, of the tonsillar region, and in the region of the auditory tube opening. The halved tongue has been retracted medially.

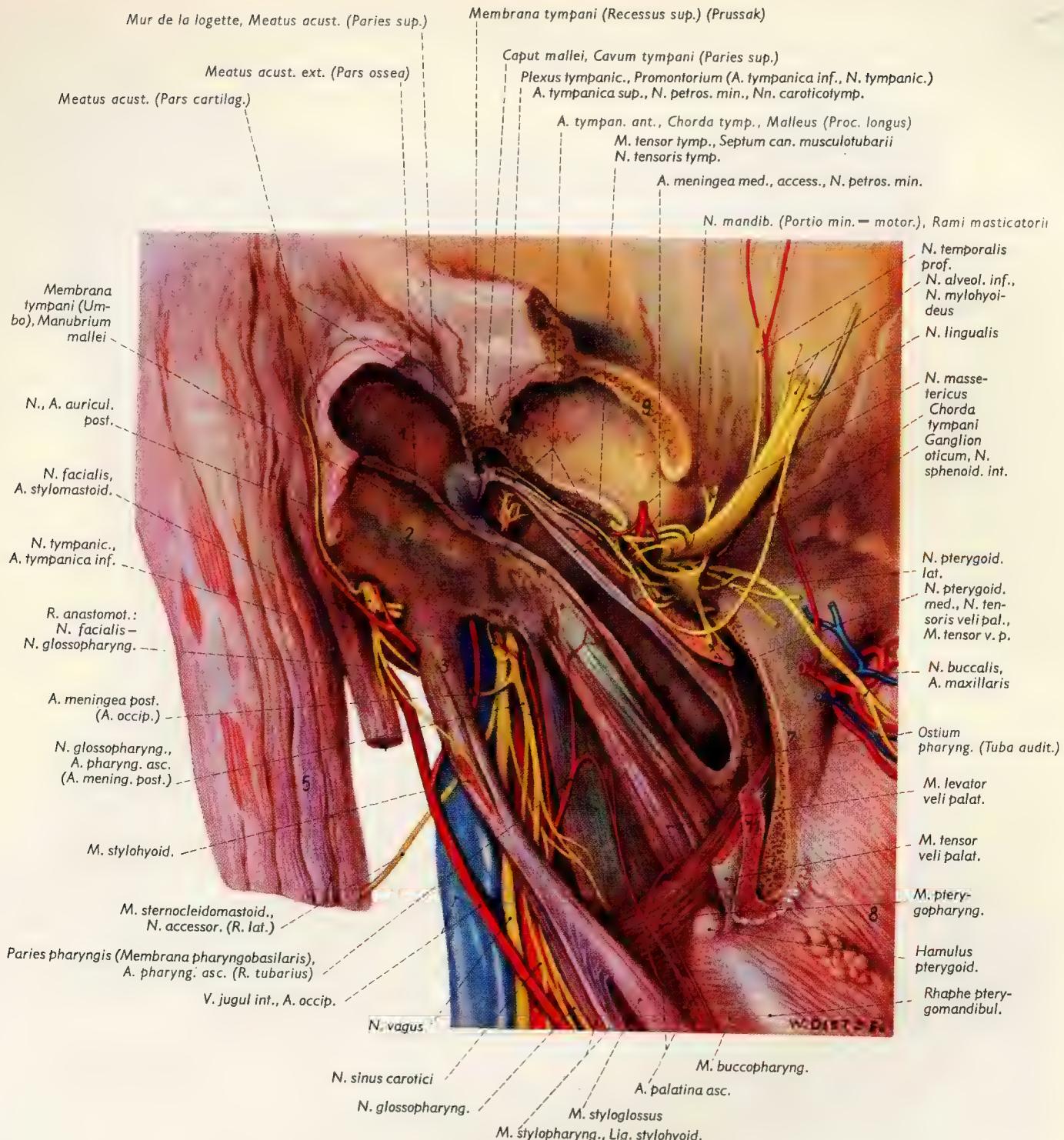


1 = M. styloglossus
 2 = M. glossopharyng. (cut)
 3 = M. palatoglossus (cut)
 4 = M. pharyngopalat. (cut)
 5 = M. stylopharyng.
 6 = lateral plate of the pterygoid process
 7 = Lat. Lamelle of the Proc. pterygoideus

8 = M. digastricus (Venter post.)
 9 = M. splenius cap.
 10 = M. longissimus cap.
 11 = M. sternocleidomastoideus
 12 = M. buccinator
 13 = aponeurosis of the palate

P = Parotis (Proc. parapharyng.)
 Sm = Glandula submandibularis
 Sl = Glandula sublingualis
 ○ = Lig. sphenomandib.
 × = Lig. pterygospinale
 + = Lig. stylomandibulare
 +○ = Lig. stylohyoideum

Fig. 304. Parapharyngeal structures seen from the medial aspect after removal of the pharyngeal wall. Dissection of the cervical neurovascular bundle up to the base of the skull. The infratemporal region with the branching of the mandibular nerve, the otic ganglion, the large salivary glands, and the course of the lingual and glossopharyngeal nerve, prepared from the medial side.



1 = Meatus acust. ext.
 2 = Os tympanicum, Crista tympanica
 3 = Processus styloideus
 4 = M. digastricus
 5 = M. sternocleidomast.

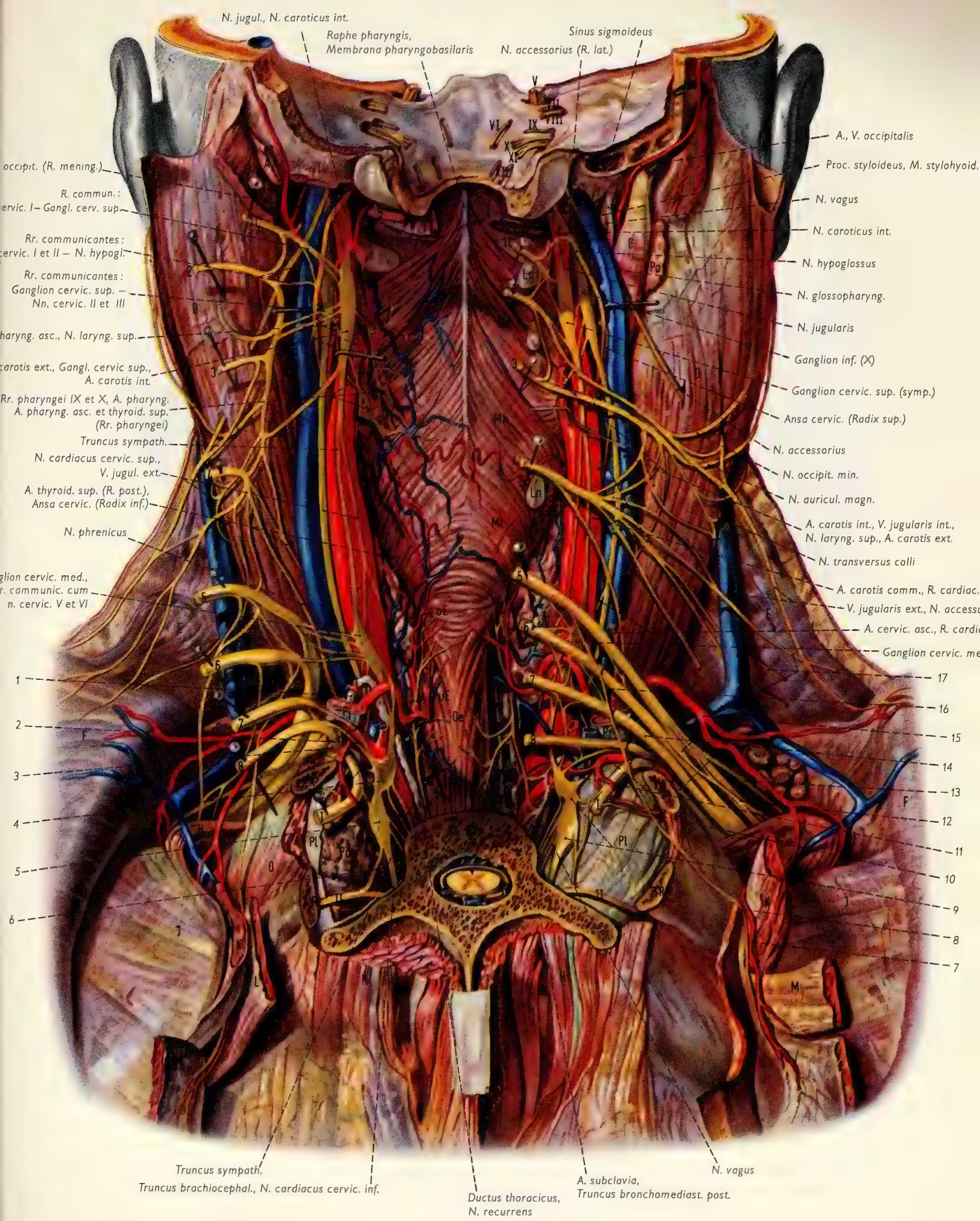
6 = border of the med. plate of the pterygoid process.
 7 = lateral plate of the pterygoid process
 8 = M. buccinator

9,10 = artic. tuberc. and base of the zygomat. proc. of the temporal bone
 11 = origin of the medial pterygoid m.
 X = isthmus of the auditory tube
 O = cartilaginous part of the auditory tube

Fig. 305. Tympanic cavity and auditory tube. Area of the otic ganglion as well as nerves and blood vessels on the base of the skull. The external auditory meatus, the tympanic cavity, and the auditory tube have been opened from the lateral side. The main branches of the mandibular n. were cut, the optic ganglion reflected upward, and the tensor veli palatini m. pulled down.

1-8	= cervical nerve trunks 1-8
I,II.	= 1st and 2nd thoracic nerves
1.R	= 1st rib
2.R	= 2nd rib
V-XII	= cranial nerves V-XII
II.BW	= 2nd thoracic vertebra
A	= M. longissimus cap.
B	= M. splenius cap.
C	= M. digastricus
D	= M. sternocleidomast.
E	= Platysma
oE	= sup. parathyroid gland
uE	= inf. parathyroid gland
F	= M. trapezius
G	= M. omohyoideus (Venter inf.)
H	= M. serratus ant.
J	= M. supraspinatus
K	= M. levator scap.
L	= M. serratus post. sup.
Ln	= Nodi lymph. retropharyngei
Me, mh, MI	= Mm. constrictores pharyngis
N	= M. erector spinae
O	= Mm. intercostales
Oe	= Oesophagus
P ₁	= M. scalenus ant.
P ₂	= M. scalenus med.
Pa	= Parotis
Pb	= cupula of pleura
Pu	= lung
oP	= sup. pole of thyroid gland
R	= M. longus cap.
S	= M. rectus cap. ant.
Tr	= Trachea
1	= Ductus thoracicus
2	= communicating rami from 7th and 8th cervical nerves to inf. cervical ganglion (vertebral n.); vertebral a. and n. medial to these rami
5	= 1st thoracic ganglion. Communicating ramus to 1st thoracic n.
6	= communicating ramus to 2nd thoracic n.
7	= A. transversa colli (R. descend.)
8	= N. dors. scapulae
9	= Ganglion stellatum (cervicale inf. and thoracale I)
10	= N. intercostalis I, A. intercostalis suprema
11	= Truncus costocervic., Ansa subclavia
12	= N. thorac. long.
13	= N. suprascapularis
14	= Plexus brachialis
15	= A. transversa colli
16	= A. thyroidea inf.
17	= Nn. supraclavicularares

Fig. 306. Dissection of cervical viscera and exposure of structures in the neurovascular bundle in situ from behind. (The vertebral column has been removed down to the 2nd thoracic vertebra; the base of the skull was cut in a frontal plane behind the condyles of the occipital bone, and the left cervical nerve trunks have been retracted laterally.



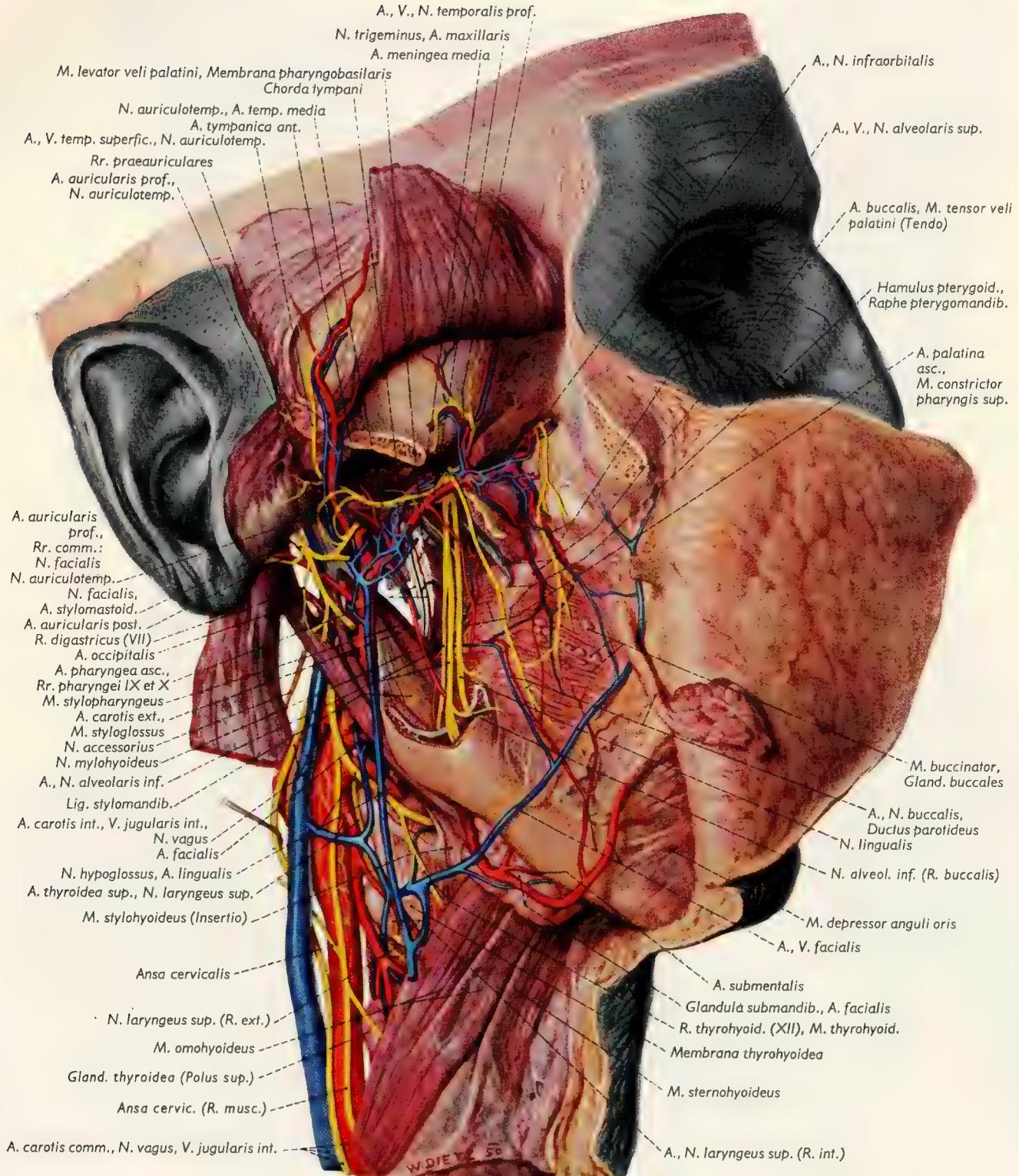


Fig. 307. Blood vessels and nerves of the deep face region and the neurovascular bundle of the neck. Blood vessels and nerves of the pterygoid region are exposed after resection of the zygomatic arch and the ramus of the mandible.

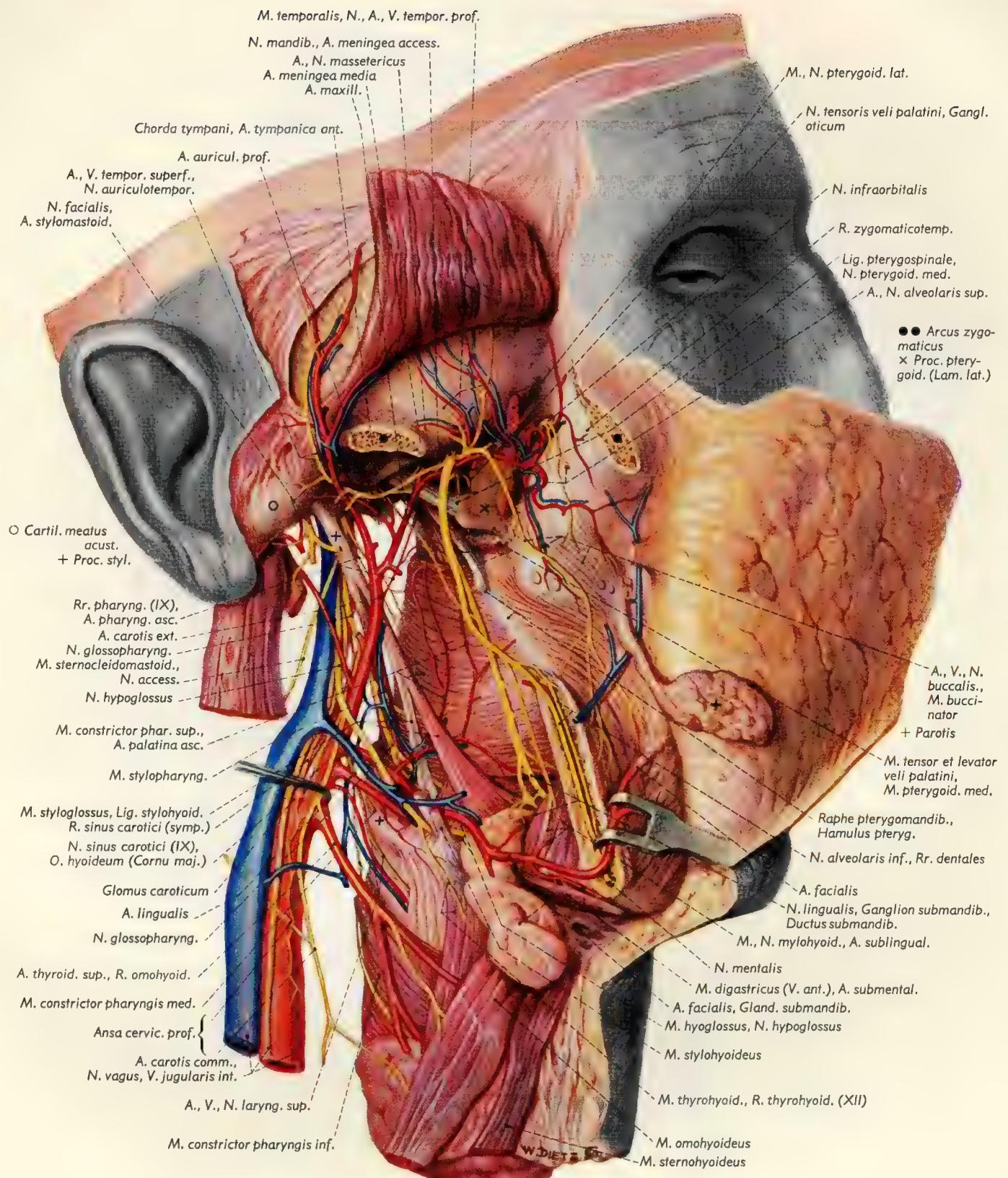


Fig. 308. Dissection of the cervical neurovascular stalk up to the base of the skull.
Division of the mandibular n. into its branches.

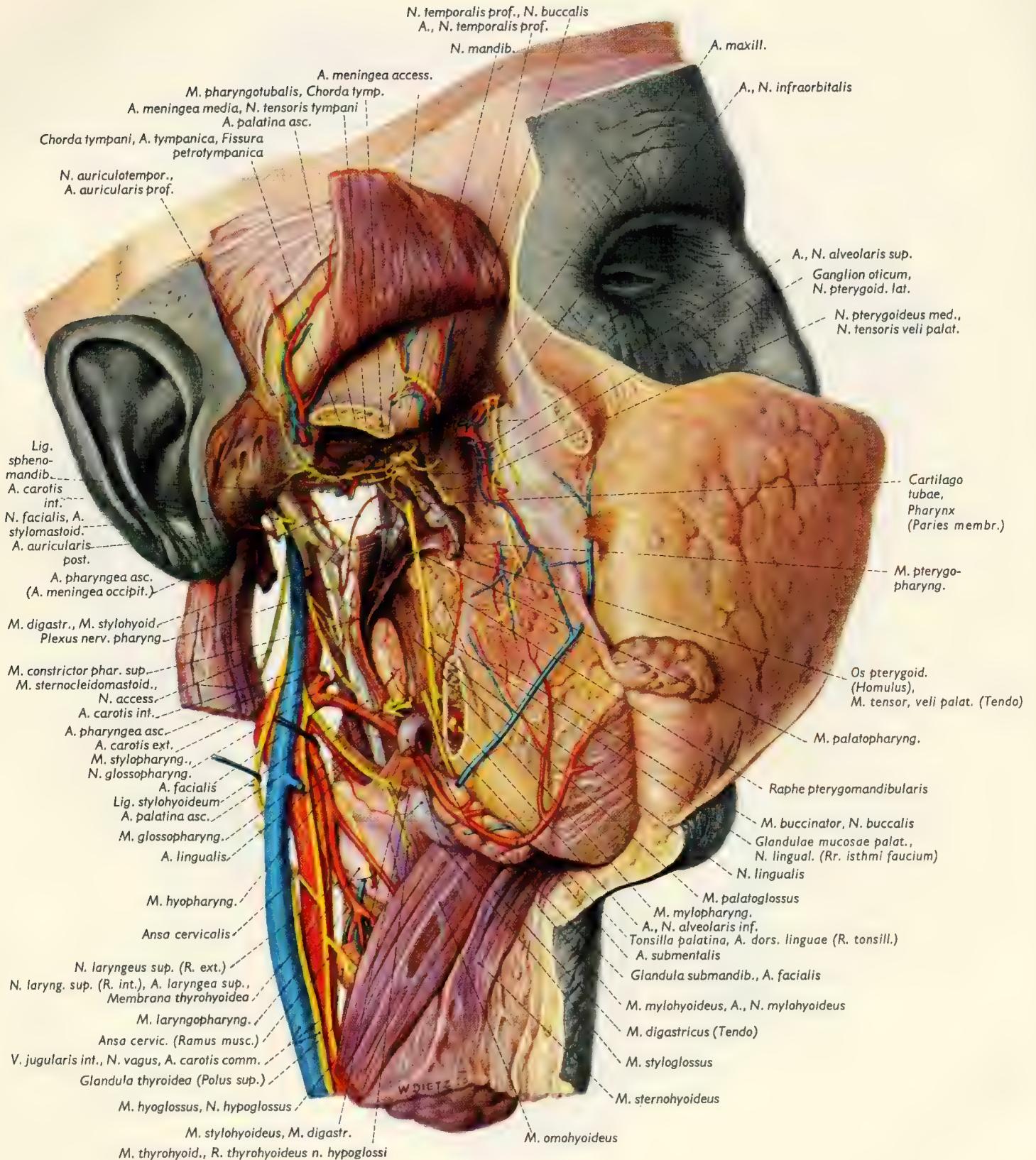


Fig. 309. Structures of the neck from the lateral side. The cervical vertebral column has been removed; the zygomatic arch and the ramus of the mandible have been cut, the former in front and in the back, and removed with the muscles of mastication after disarticulation of the temporomandibular joint. With maximal depression of the mandible, access is gained to a large area of the lateral pharyngeal wall.

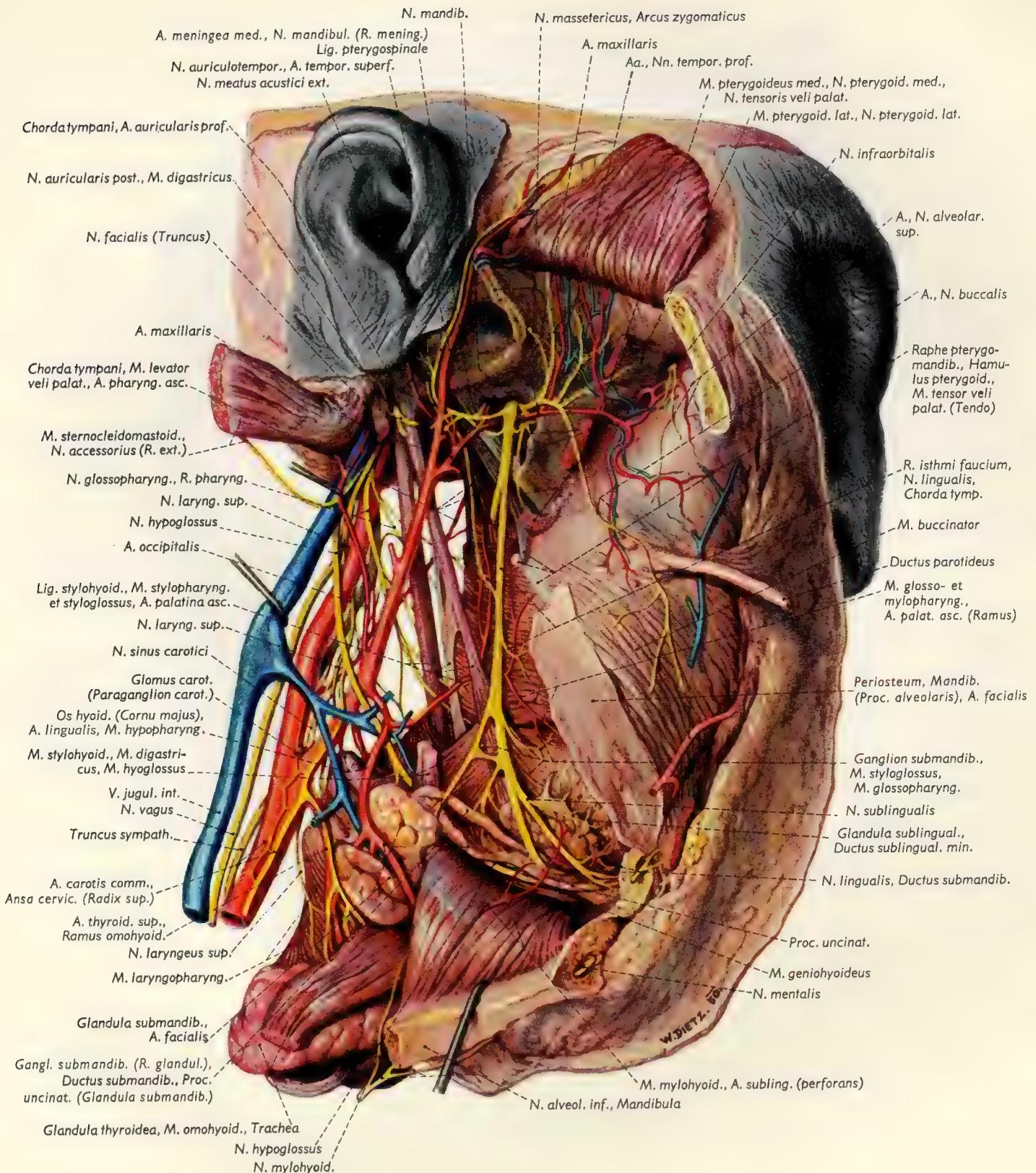
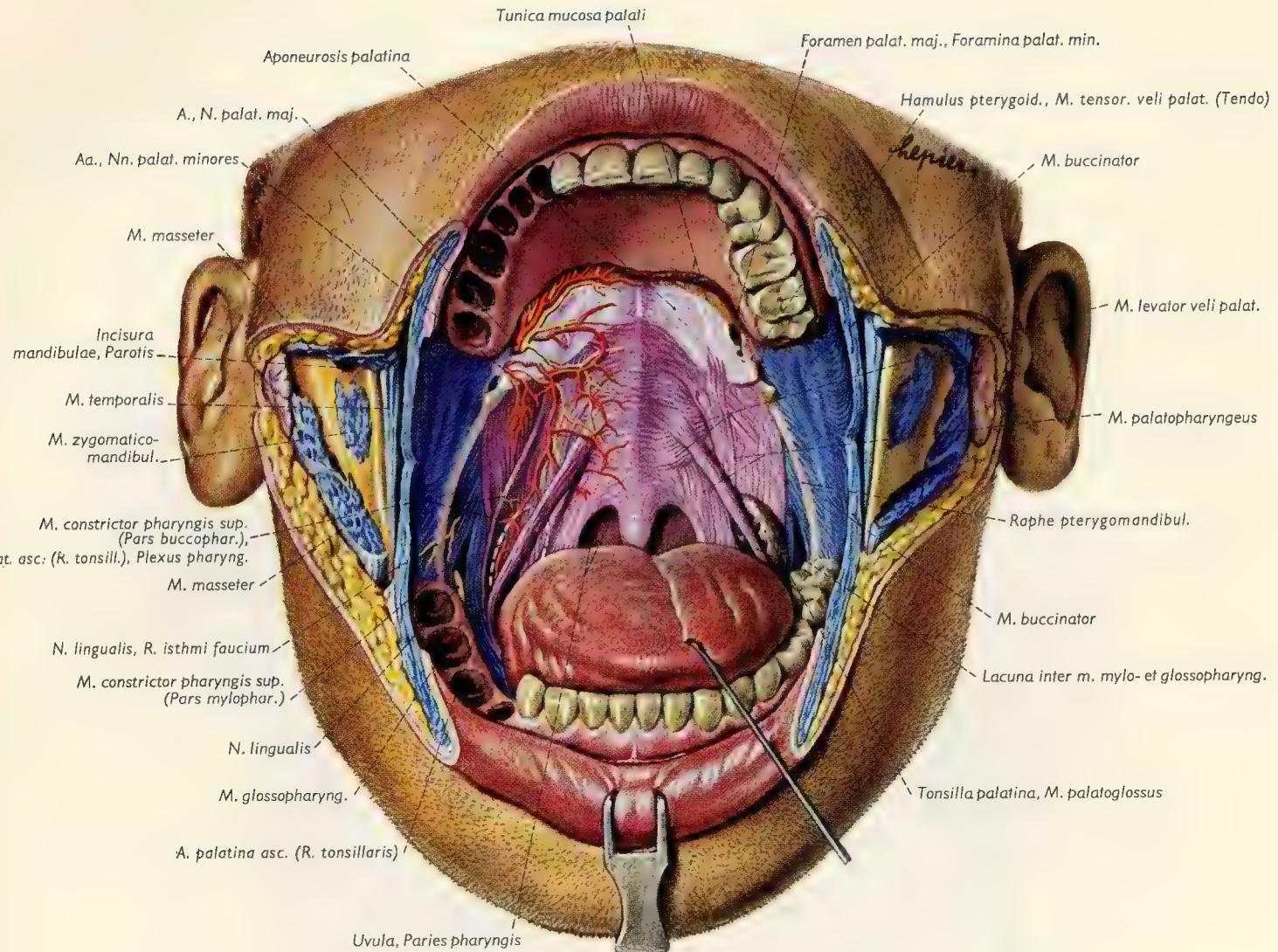
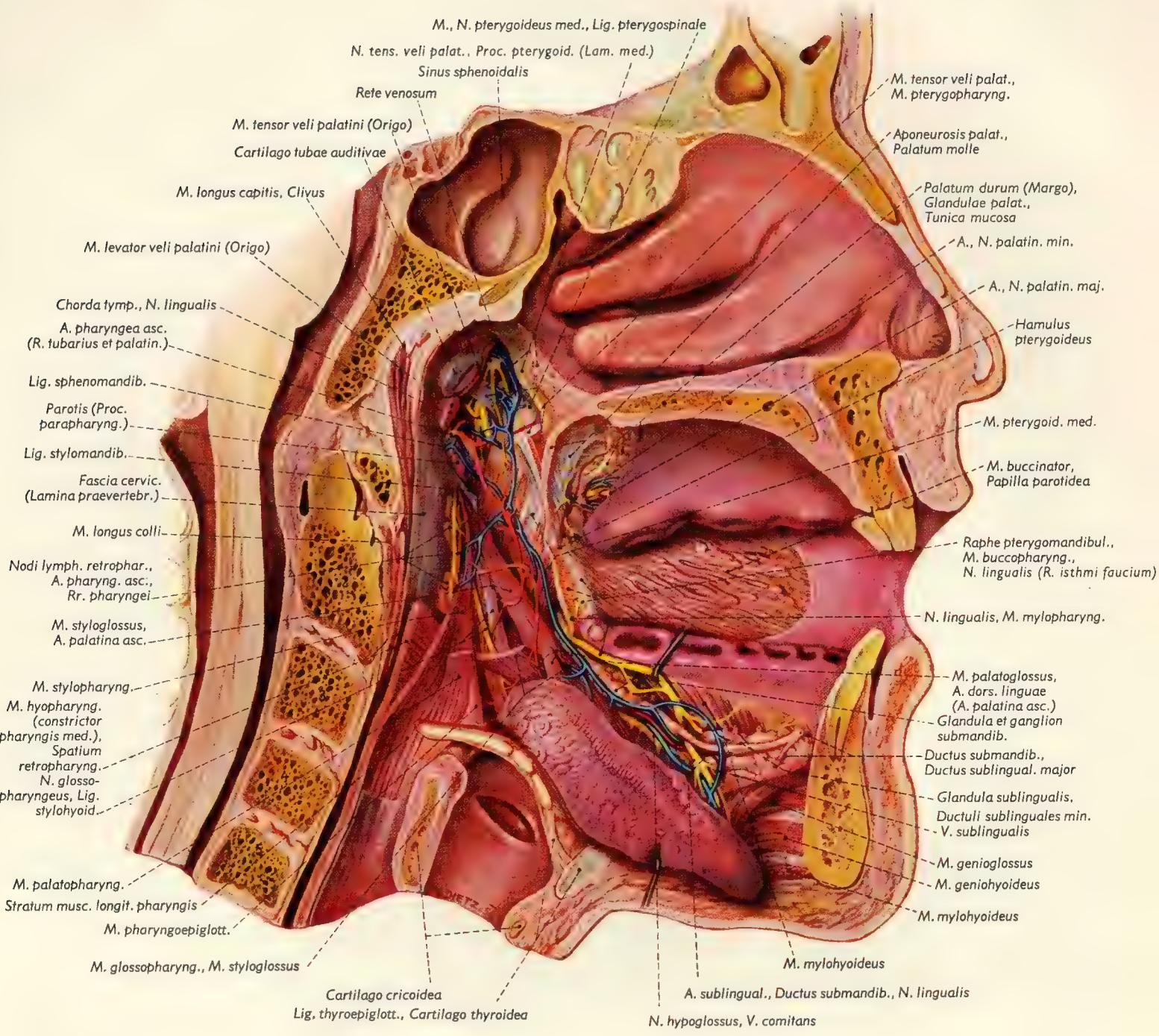


Fig. 310. Dissection of the right cervical neurovascular bundle. The right half of the body of the mandible has been sawed through in a parasagittal plane, freed subperiosteally, and retracted downward with the mylohyoid m. in order to expose structures in the sublingual region (anomalous course of the maxillary a. medial to the mandibular nerve trunk; the ascending pharyngeal a. arises here from the internal carotid a.). View of the course and branches of the maxillary a.



Violet = musculature of the palate and the palatine arches
 Blue = the sup. pharyngeal constrictor with its
 3 parts that are visible here
 (buccopharyngeus, mylopharyngeus, and glossopharyngeus),
 the muscles of mastication
 (masseter and temporal muscles),
 and the musculature of the cheek
 (buccinator muscle)

Fig. 311. Topographical relationships and blood supply of the palatine tonsil; dissection of the palatine musculature from the oral side (semischematic).



1–5 = median section of cervical vertebrae 1–5

Fig. 312. Median section through the facial skeleton and the pharynx. Dissection of the pharyngeal and palatine musculature from the inside; vessels and nerves in the tubal and sublingual regions.

Larynx

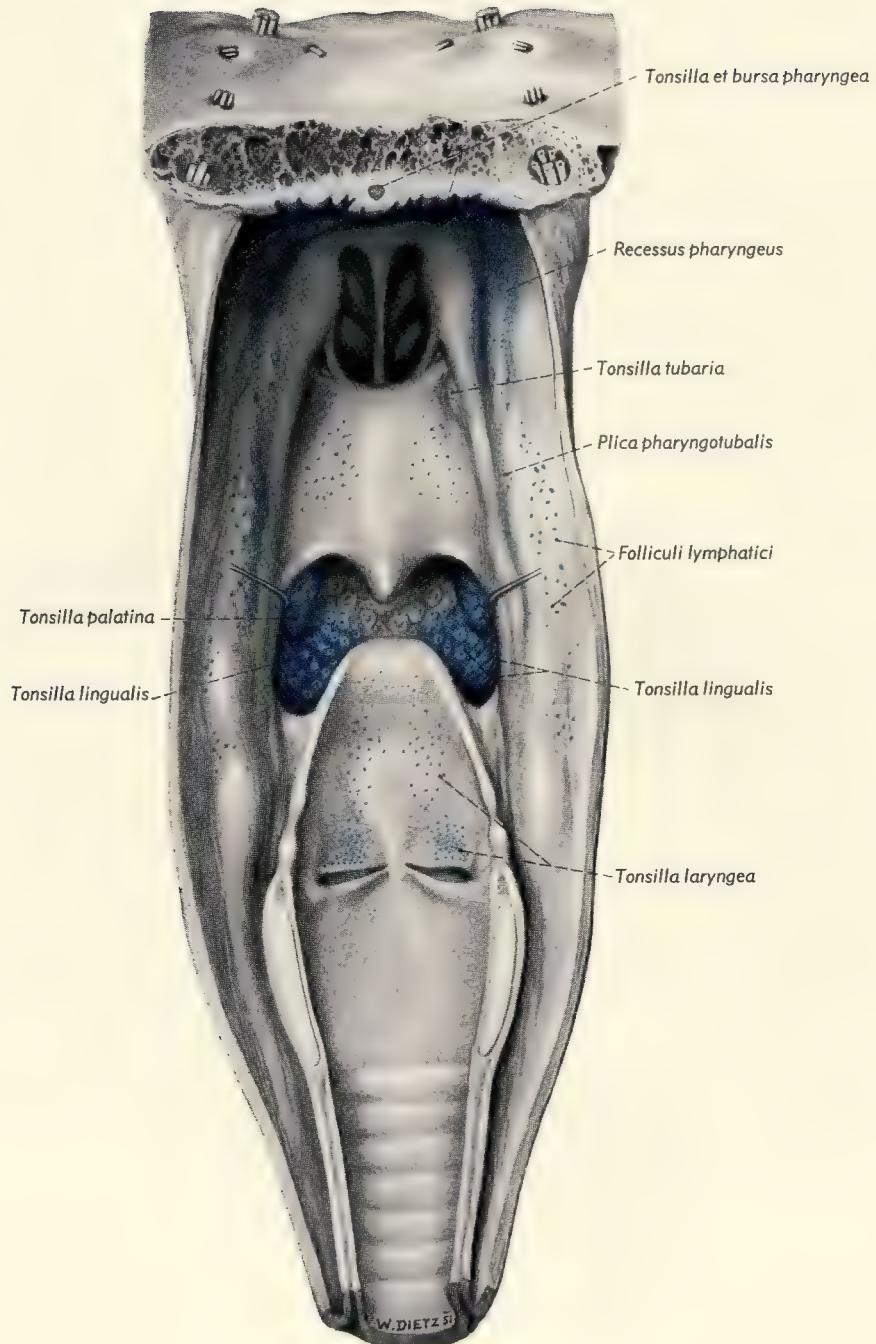
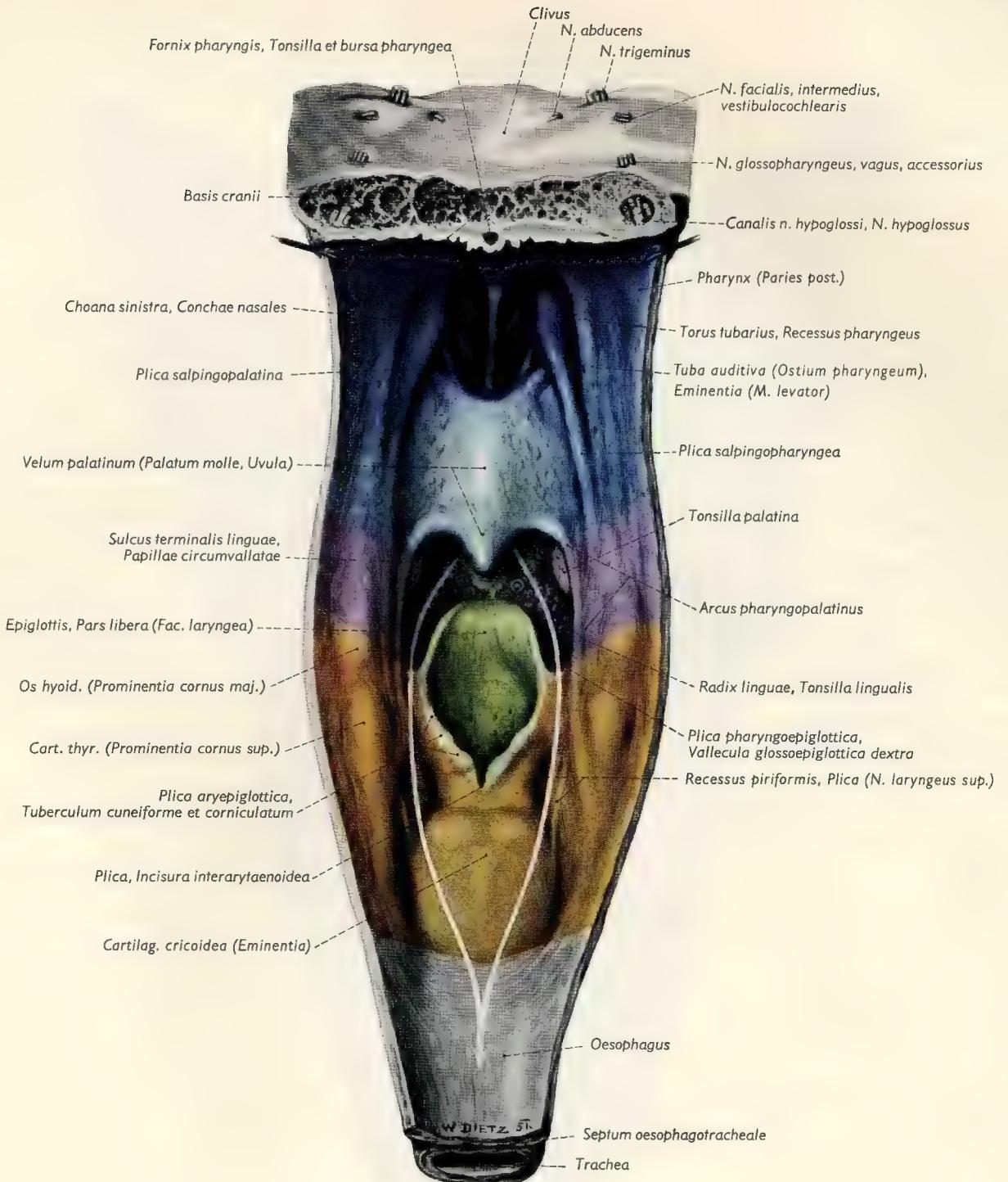


Fig. 313. The distribution of tonsillar tissue in the mucosa of the upper respiratory and gastrointestinal tracts. The lymphatic rings near the anterior apertures of the pharynx and the lateral columns in the pharyngeal wall are colored blue (semischematic). Pharynx and larynx are opened in the posterior midline.



Blue = nasal pharynx (epipharynx)
Violet = oral pharynx (mesopharynx) and isthmus of the fauces
Brown = laryngeal pharynx (hypopharynx)
Green = vestibule of larynx

Fig. 314. Regions of the pharynx and entrance into larynx (aditus). The 3 levels of pharynx, opened from behind. The food-conducting channels that run from the isthmus of the fauces, on both sides of the epiglottis, over the piriform recess, and then reunite in the esophagus are indicated by white lines.

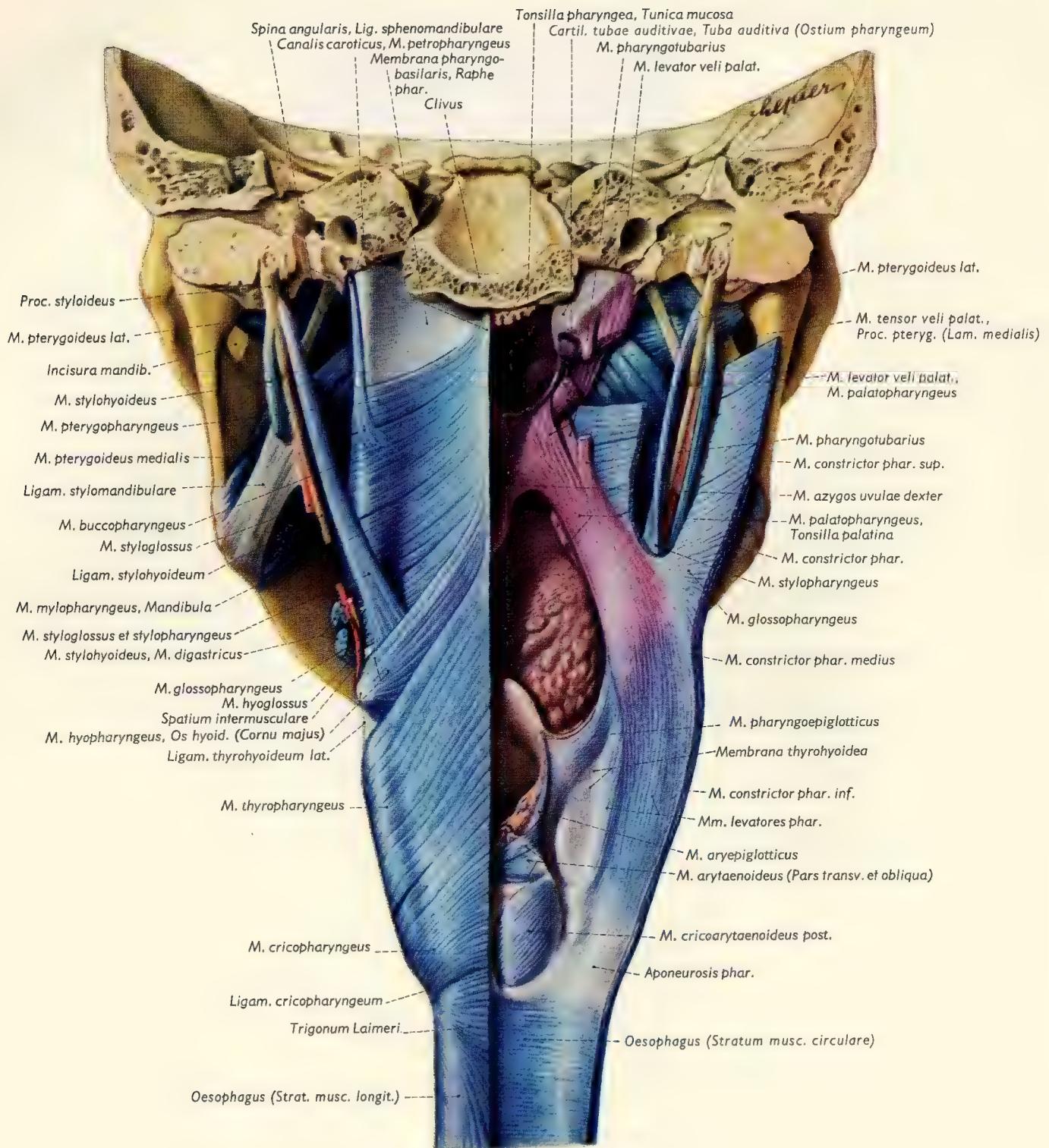


Fig. 315. The musculature of the pharynx shown from behind. The right half of the pharynx has been reflected laterally. On the left side pharyngeal muscles are seen from the outside; on the right the pharyngeal and palatine muscles may be viewed from the inside.

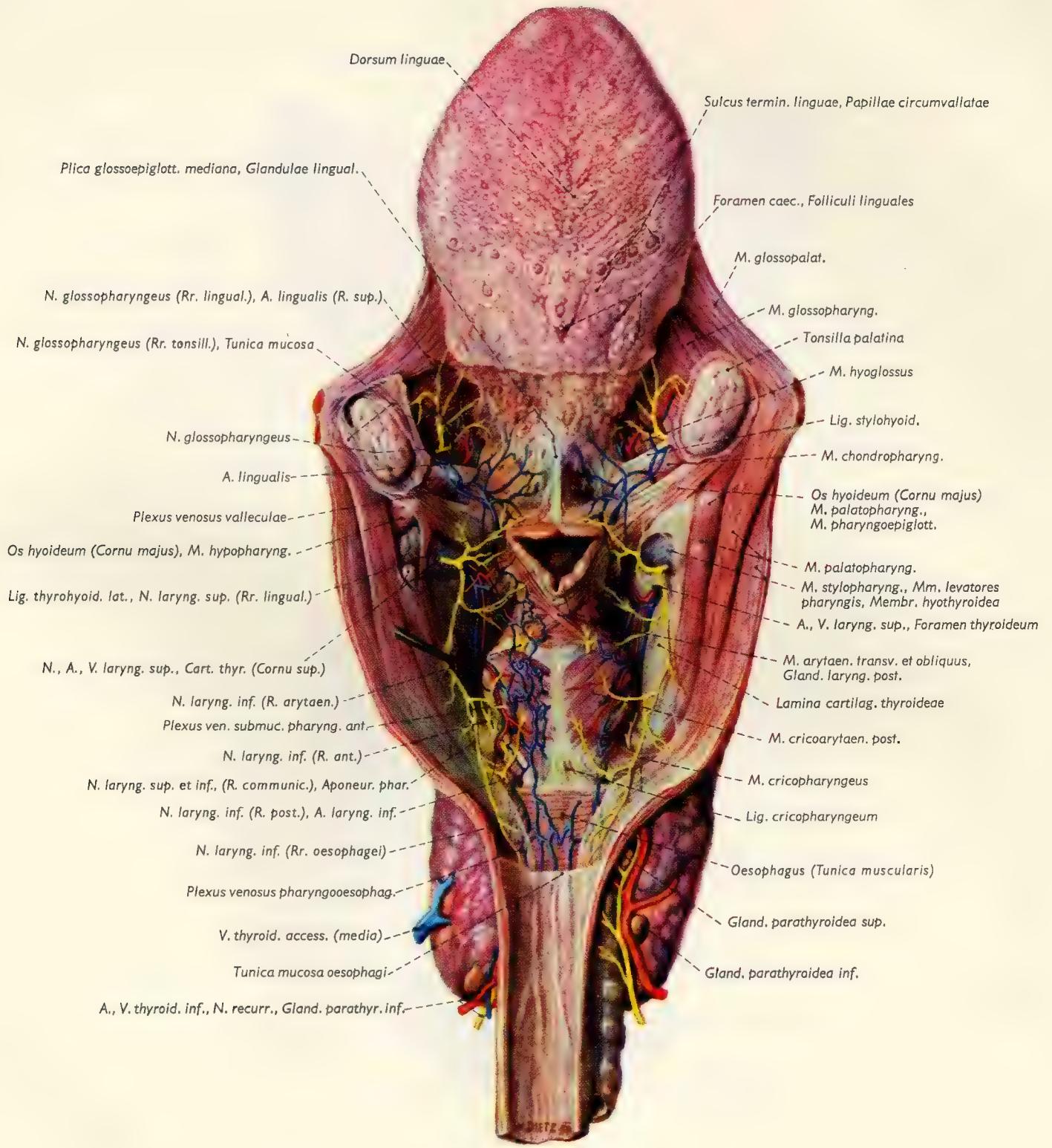


Fig. 316. Muscles, vessels, and nerves on the back side of the larynx, in the posterior tongue region, and in the regions of the palatine tonsils and the glossoepiglottic valleculae. Pharynx and esophagus have been opened from behind so that a posterior entry may be made into the paralaryngeal submucosal space after removal of the pharyngeal mucosa (of the piriform recess). The thyroid and parathyroid glands.

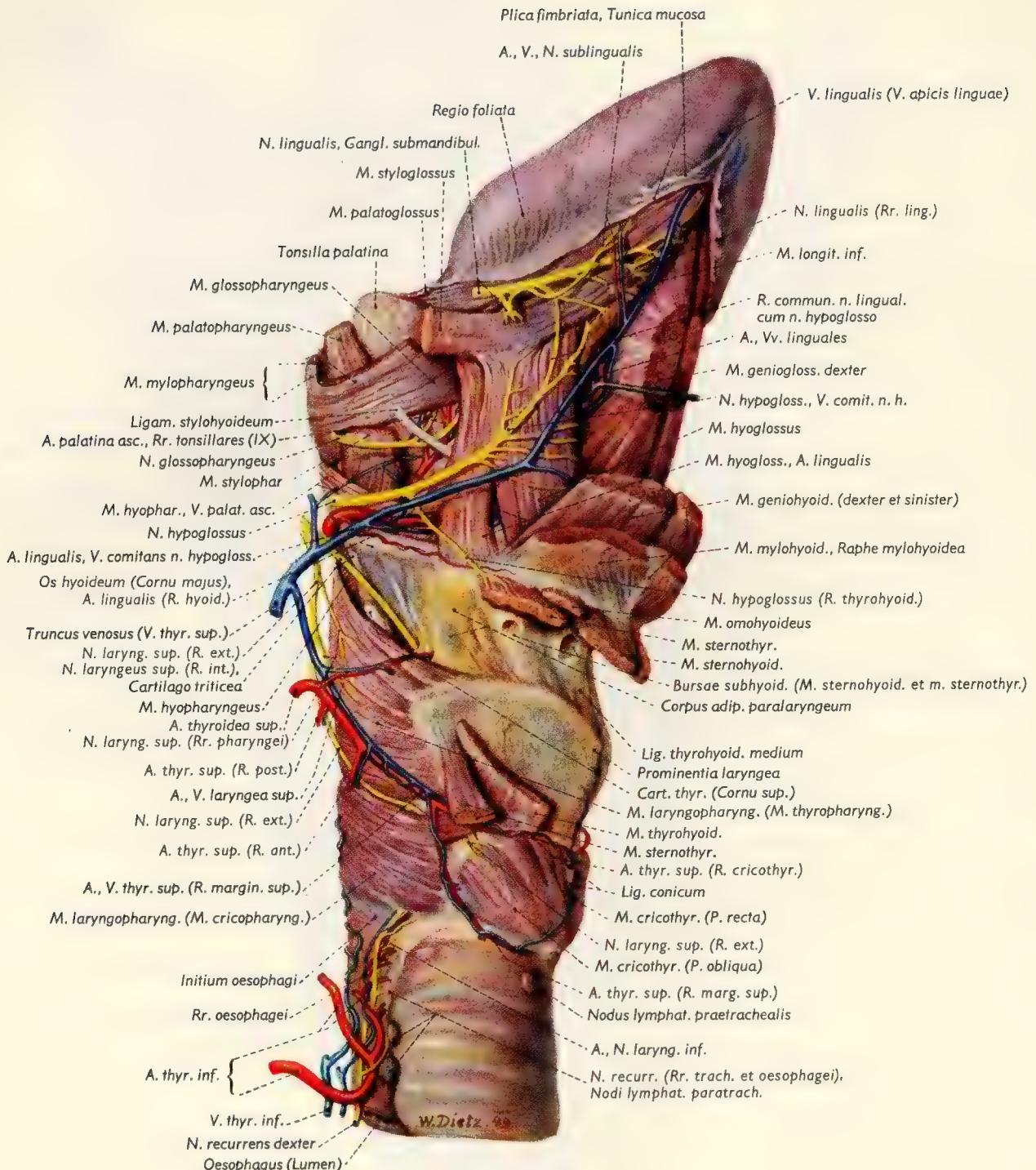


Fig. 317. Dissection of muscles, vessels, and nerves on the ventrolateral aspect of larynx and pharynx after removal of the suprathyroid and infrathyroid muscles, and resection of the thyroid gland. Muscles, nerves, and vessels at the base of the tongue.

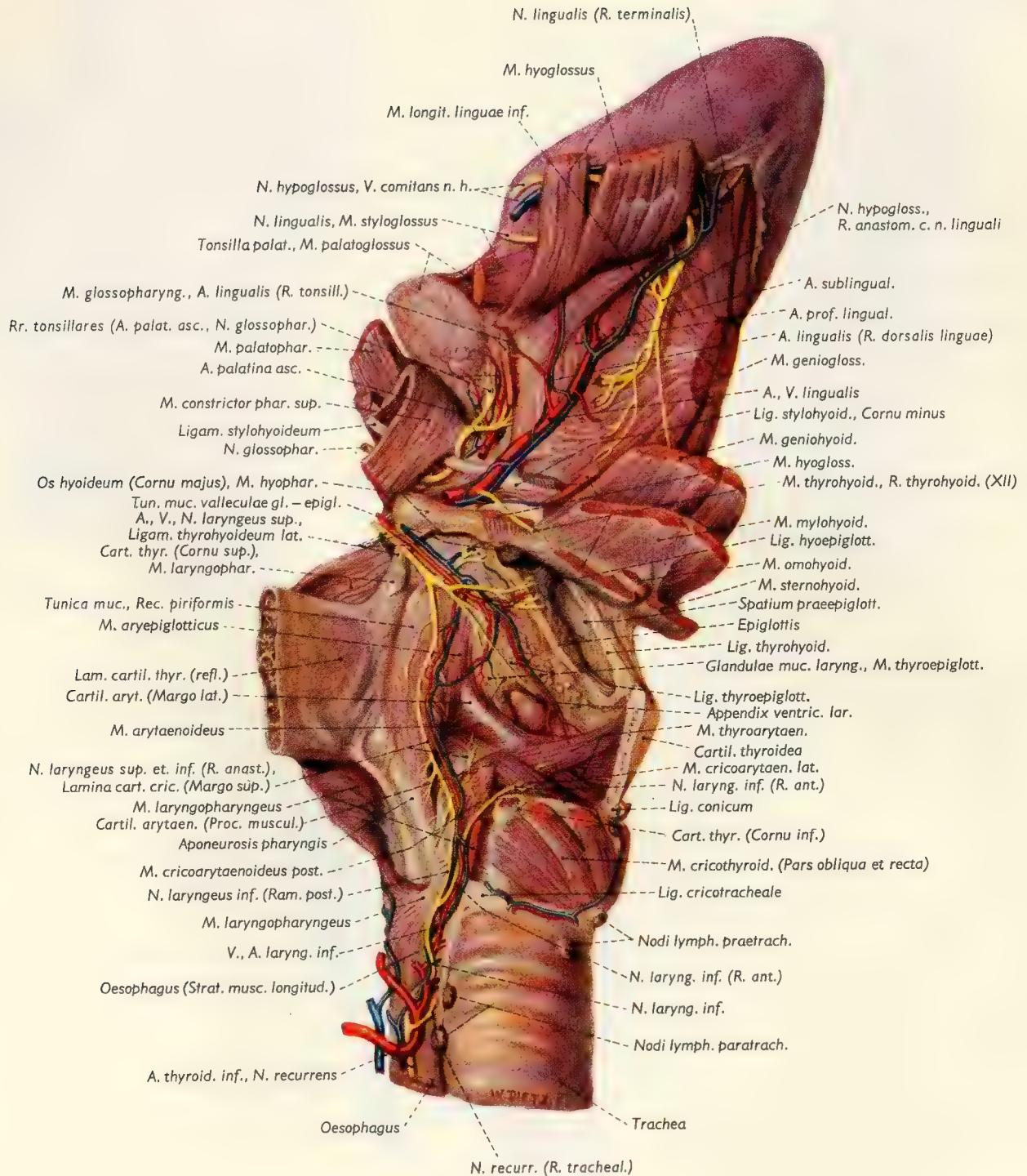


Fig. 318. Deep muscles, vessels, and nerves on the ventrolateral aspect of the larynx. The thyroid cartilage has been cut parasagittally and reflected back after freeing it from the underlying structures without disturbing the mucosa of the piriform recess and larynx. The hyoglossus m. has been removed in order to show the course of the lingual a. and the glossopharyngeal n., as well as the attachment of the stylohyoid lig. to the lesser horn of the hyoid bone.

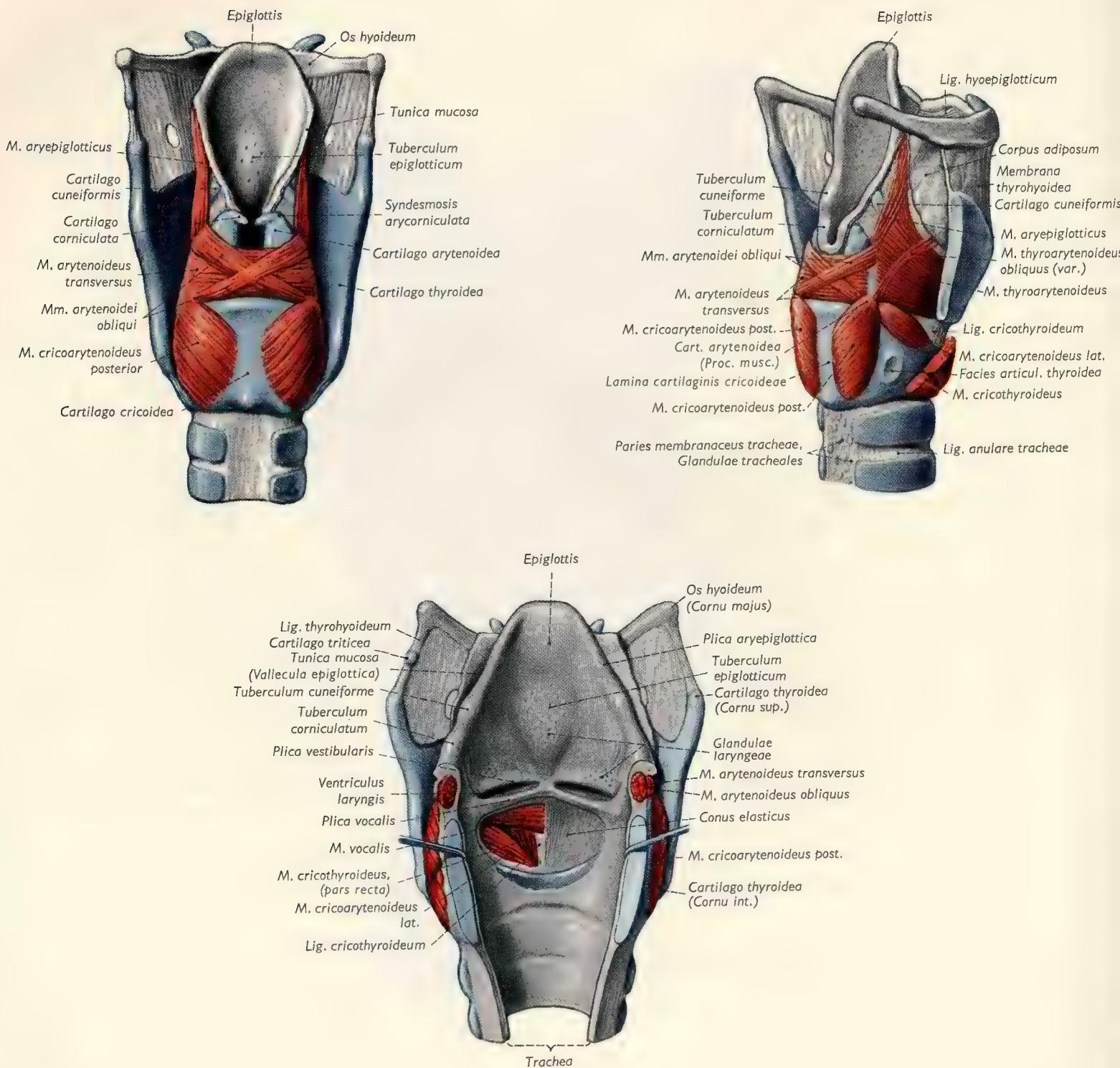


Fig. 319. (Top, left) Muscles on the dorsal surface of larynx (from Sobotta/Becher).

Fig. 320. (Top, right) Posteroinferior view of laryngeal musculature (from Sobotta/Becher).

Fig. 321. (Bottom) Larynx opened in the dorsal midline and spread apart by retractors. The mucosa has been removed between the vocal fold and the upper edge of the arch of the cricoid cartilage, and the musculature of the left side has been dissected from the inside (from Sobotta/Becher).

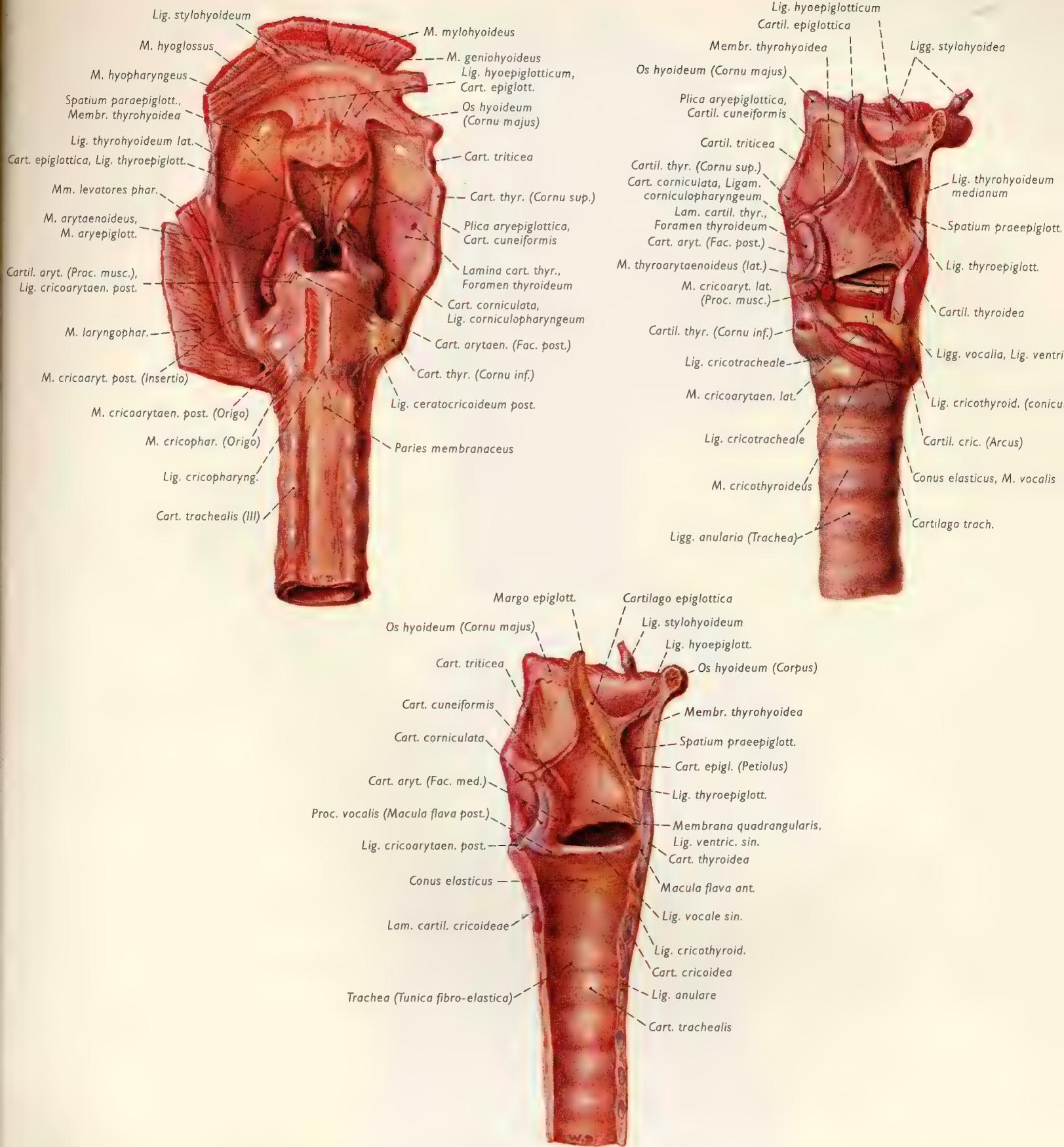
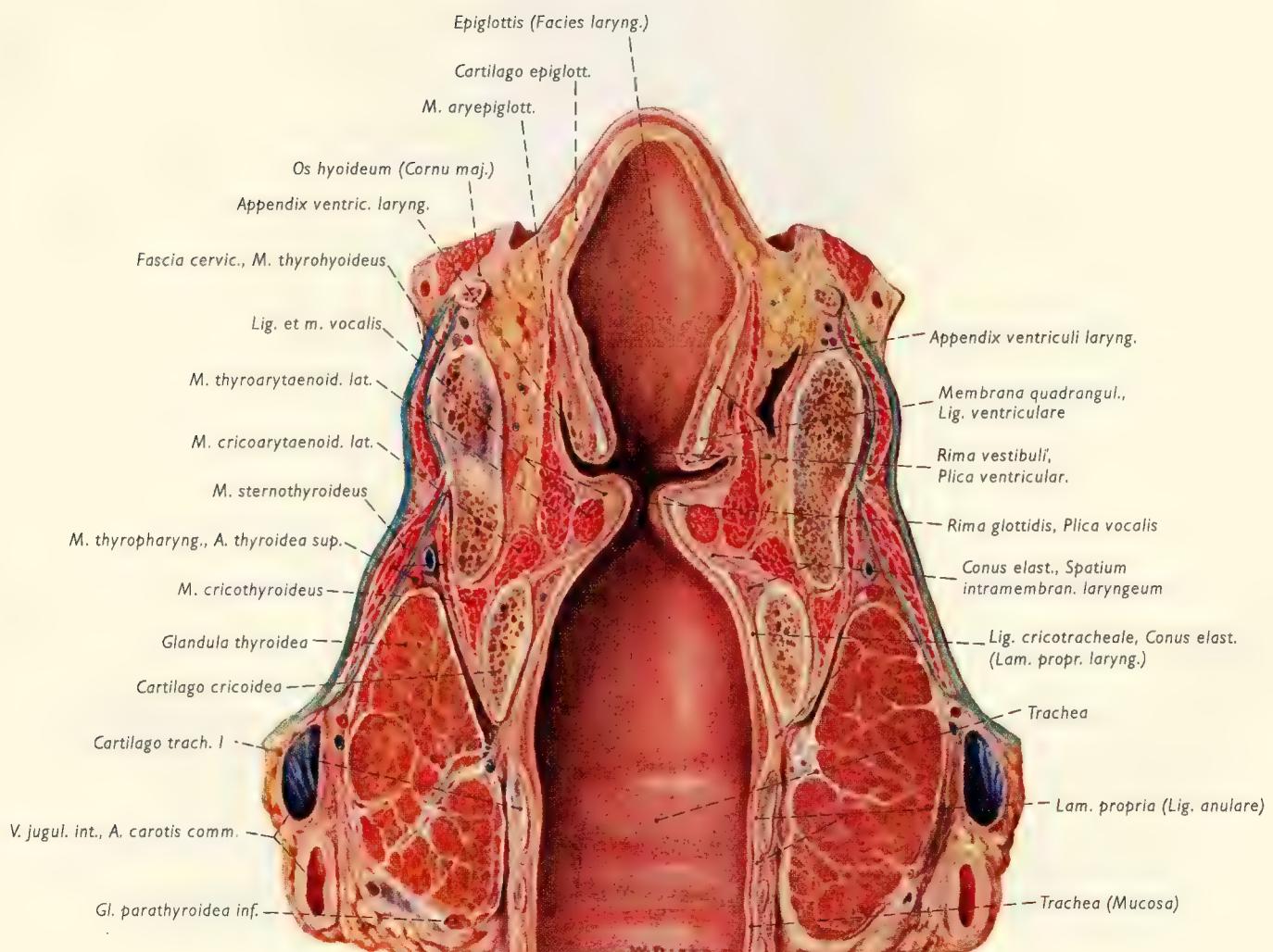
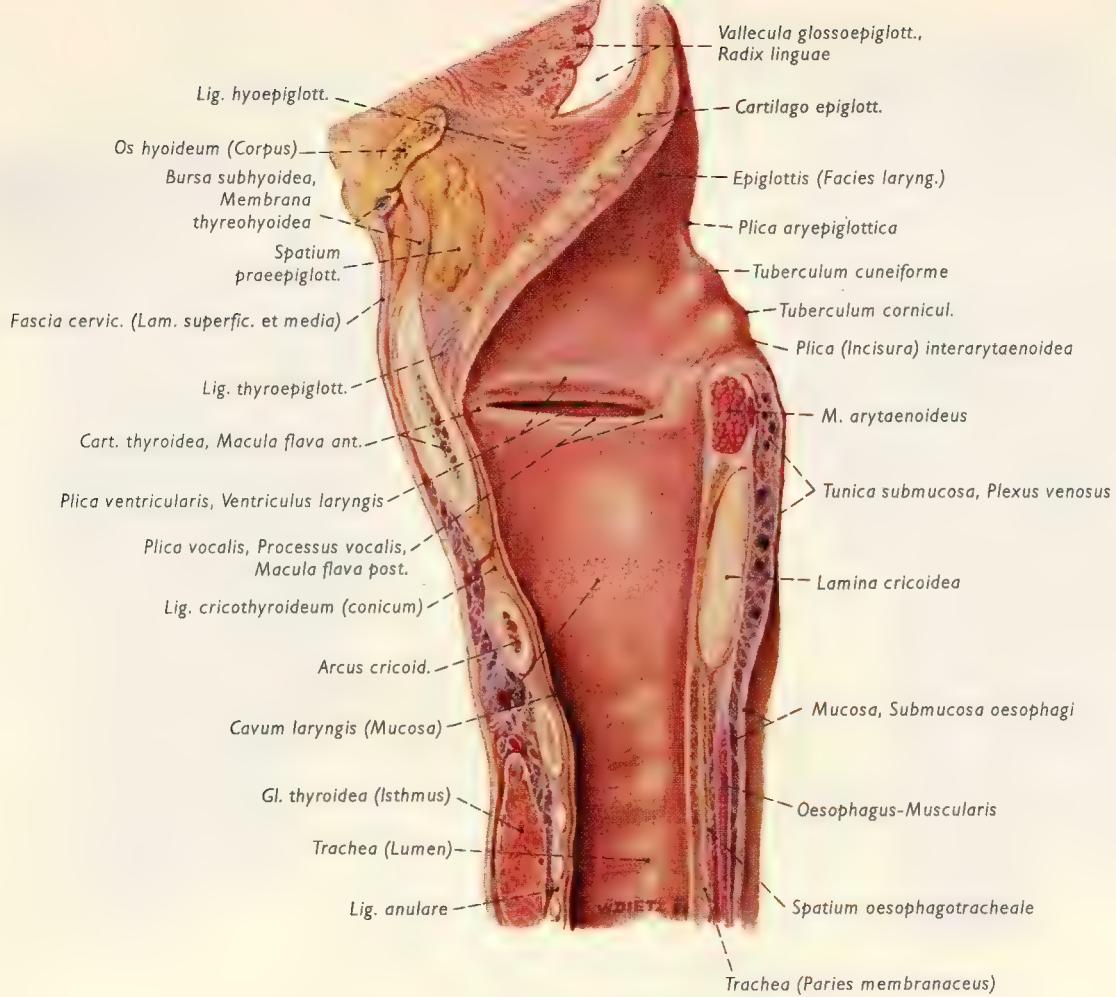


Fig. 322. (Top, left) Larynx seen from behind. The musculature of pharynx and larynx has been completely removed from the right side; the origins and insertions of this musculature as well as the muscles of the hyoid bone have been retained on the left side (epiglottis is pulled down somewhat).

Fig. 323. (Top, right) Larynx seen from the side. The right greater horn of the hyoid and the right half of the thyroid cartilage with the thyrohyoid membrane are removed. The elastic cone with the vocal lig., the vocalis m., and the quadrangular membrane with the ventricular lig. are seen on the right side.

Fig. 324. (Bottom) Median section through larynx. The mucosa has been stripped of its epithelium.



Green = cut edges of the cervical fascia including both laminae

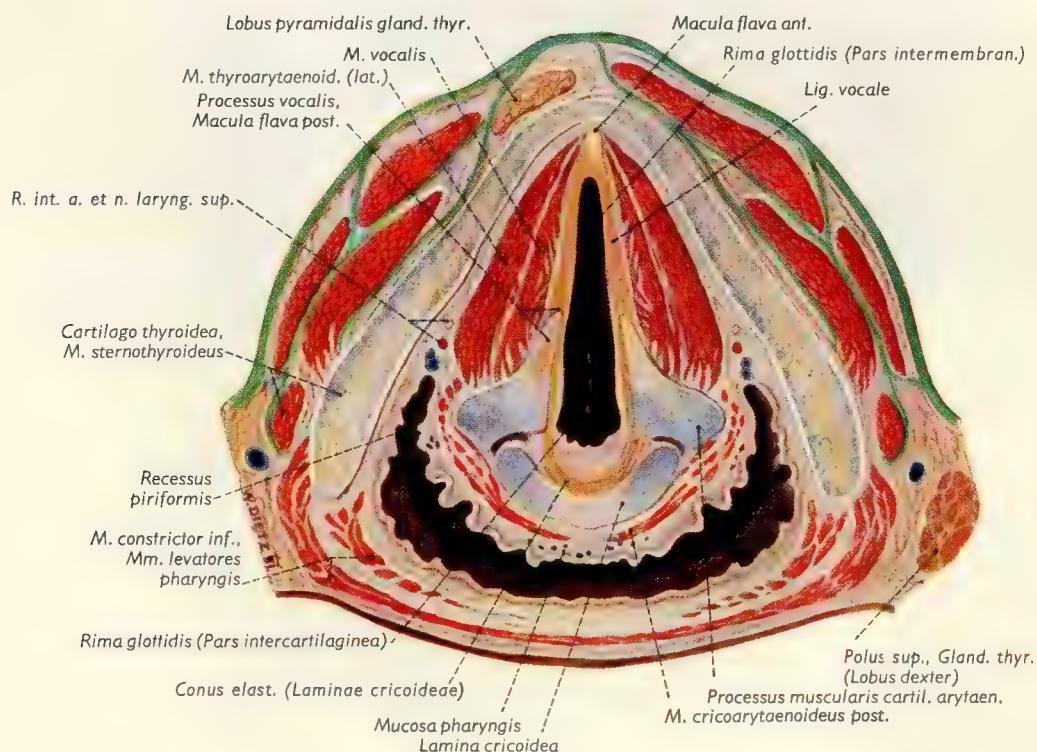
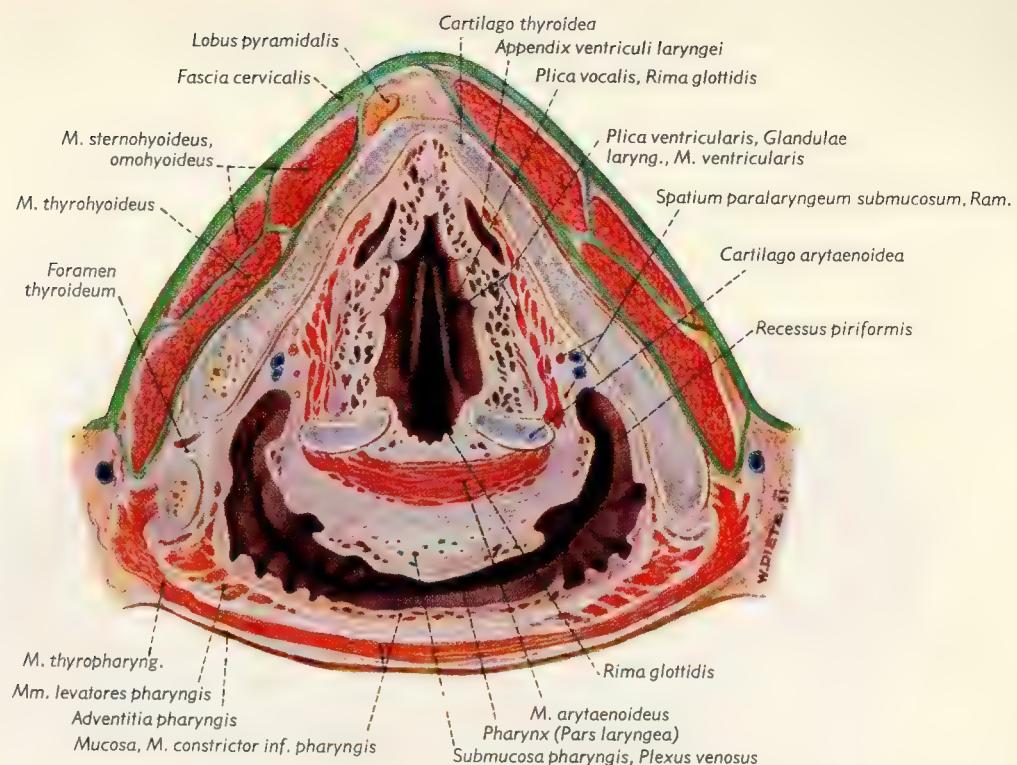


Fig. 327. (Top) Transverse section through larynx and pharynx at the level of the ventricular fold (cut fascial edges are green).

Fig. 328. (Middle) Transverse section through the larynx and pharynx at the level of the vocal fold (cervical fascia investing the infrathyroid muscles is green).

Fig. 325. (Left, top) Midsagittal section through larynx. The figure illustrates larynx with the adjoining part of the trachea and the root of the tongue in med. section (right half of specimen).

Fig. 326. (Left, bottom) Frontal section through the larynx and the 2 lobes of the thyroid gland showing the larynx, the 3 compartments of the laryngeal space, and the adjacent portion of the trachea. Anterior half of the specimen seen from behind. On the right side, in the submucosal paralaryngeal space, is seen a markedly expanded appendix of the laryngeal ventricle.

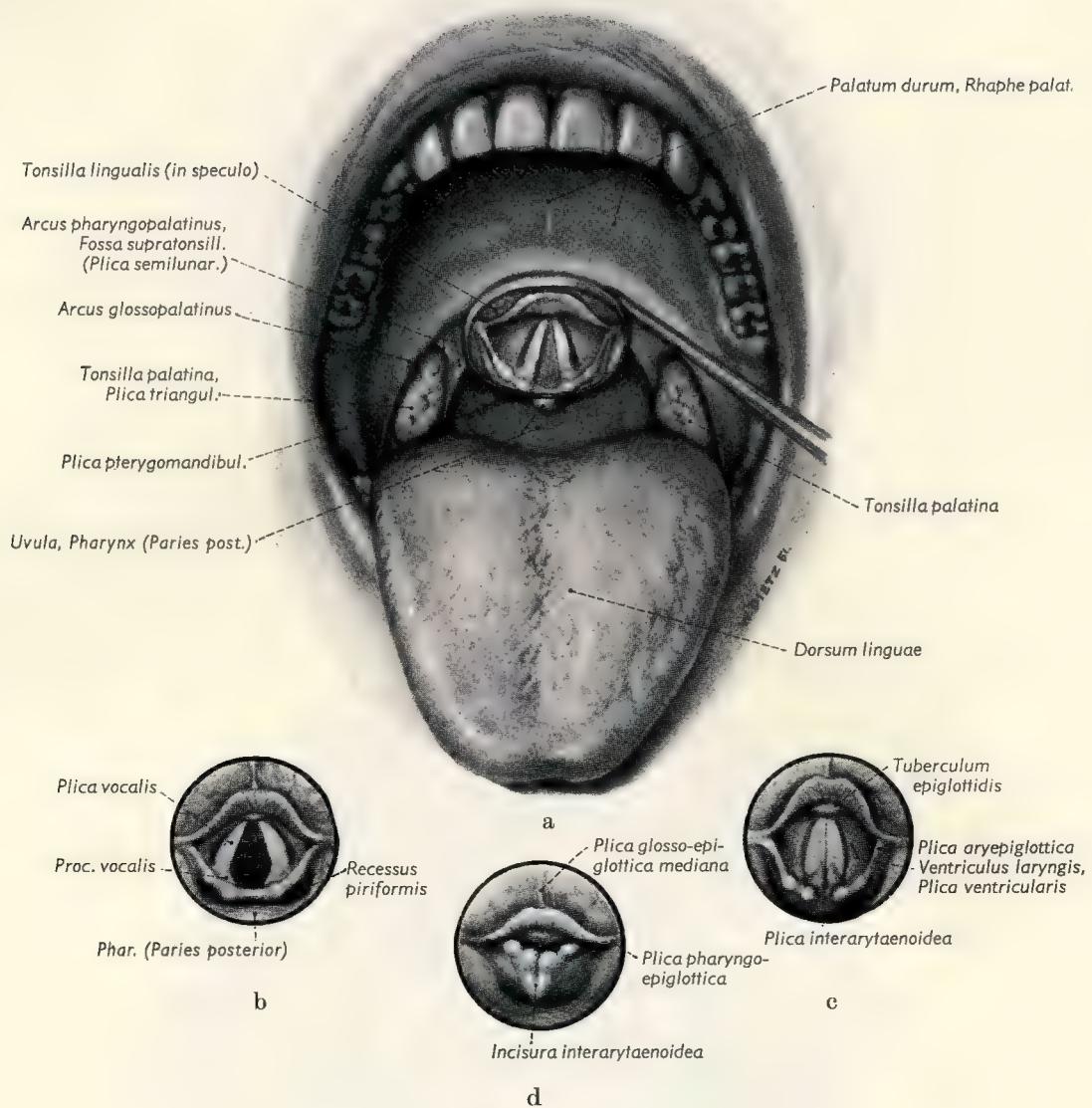


Fig. 329. Laryngoscopic view. With the mouth wide open, protracted tongue, and the head bent slightly backward, the mirror has been placed against the soft palate at an angle of approximately 45° in such a way that the uvula is completely covered, and the inferior edge of the mirror touches the posterior pharyngeal wall (illumination "normal"). In the mirror the image of the interior of larynx is reversed with anterior becoming superior, and posterior becoming inferior.

a) shows the rima glottidis during quiet breathing, triangular in shape, and with approximately the same appearance as that seen in a cadaver (intermediate position); b) shows the rima glottidis during deep inspiration, pentagonal in shape (abduction, respiration position); c) shows rima glottidis completely closed (adduction, median, or phonation position); d) shows the aditus of larynx almost completely closed by the approximation of the small cartilages in the aryepiglottic folds; the epiglottis (free part) is not completely folded back.

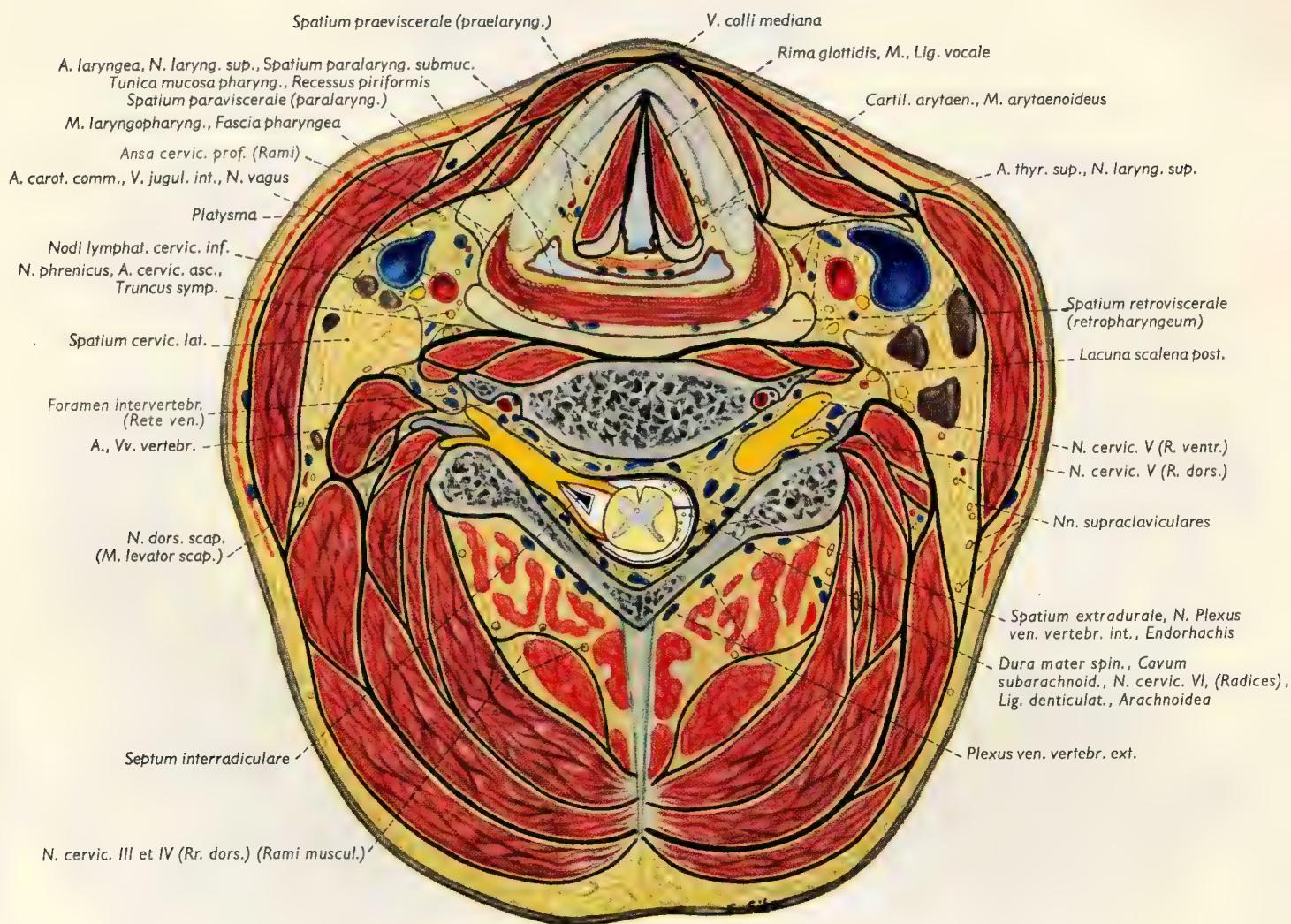
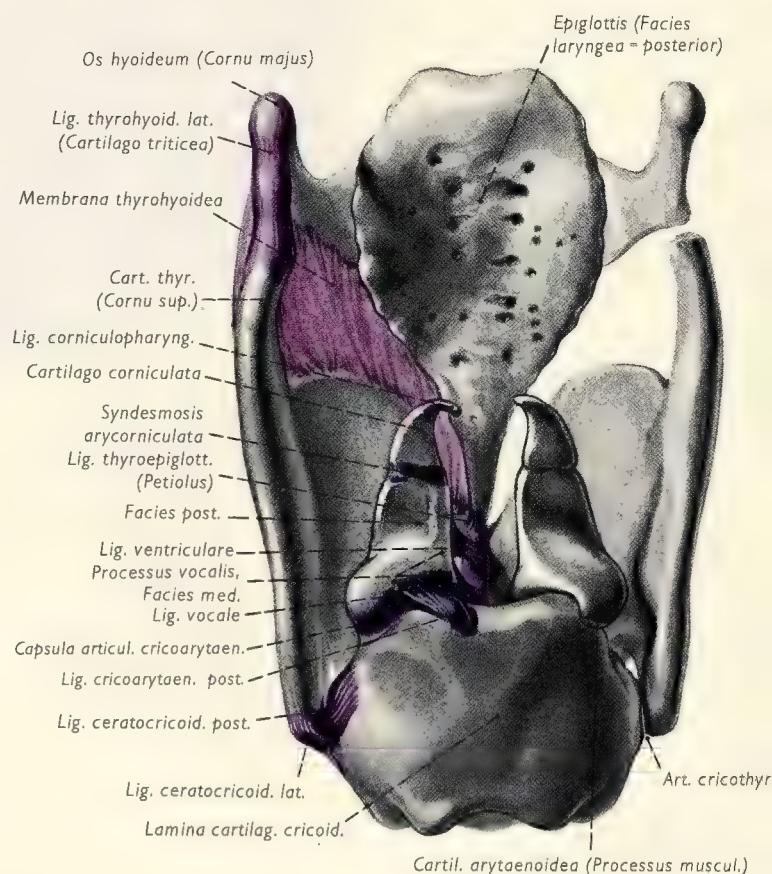
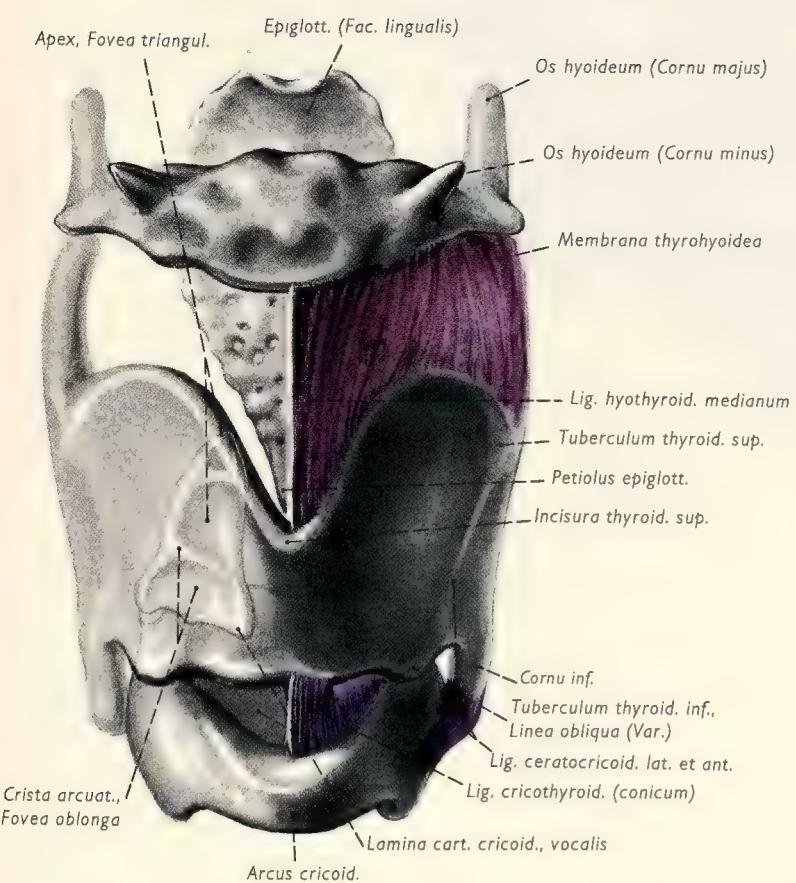
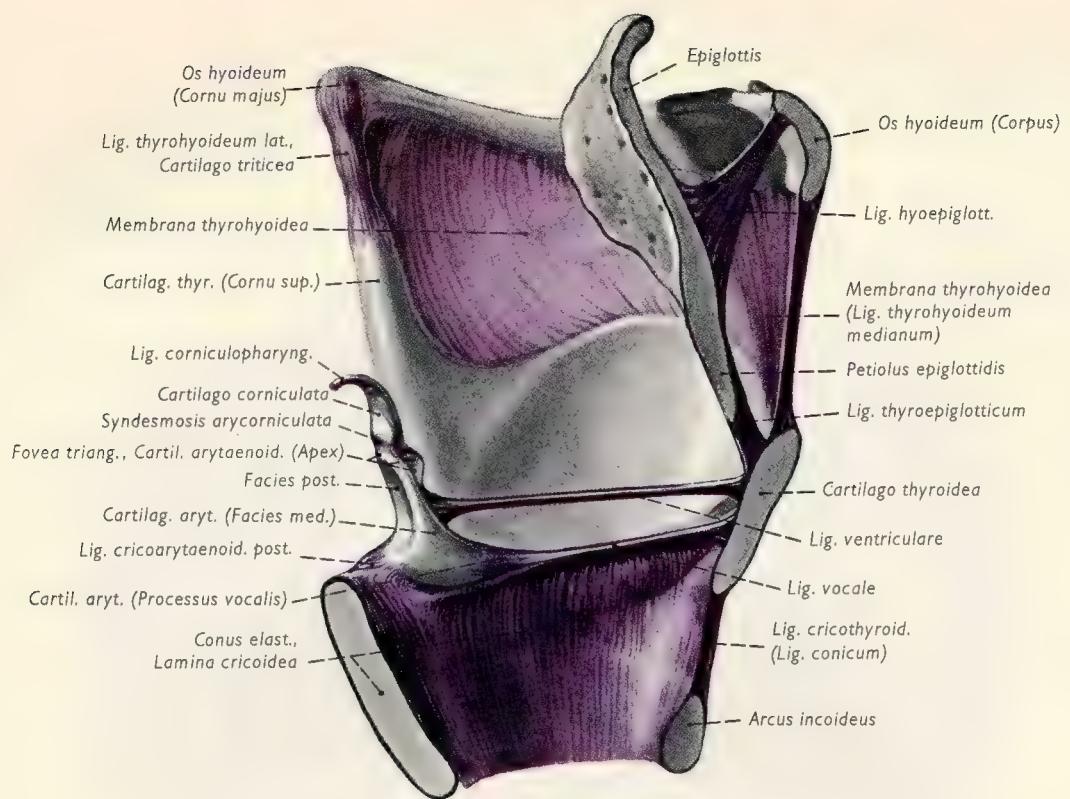


Fig. 330. Transverse section through the neck at the level of the glottis with the contents of the neural and visceral compartments. Illustration of the viscera, the cervical neurovascular bundles, and sheaths in cross section. Plane of section through the 5th cervical vertebra and the vocal cords. The cut edges of fasciae, periosteum, and spinal cord investments are black; those of the neurovascular sheaths are lighter in color.



blue = ligaments, quadrangular membrane not shown

Fig. 331. Skeletal framework and ligaments of larynx. a) Medial view of the left half. b) Viewed from front (right arytenoid cartilage is seen through the thyroid cartilage). c) View from behind.

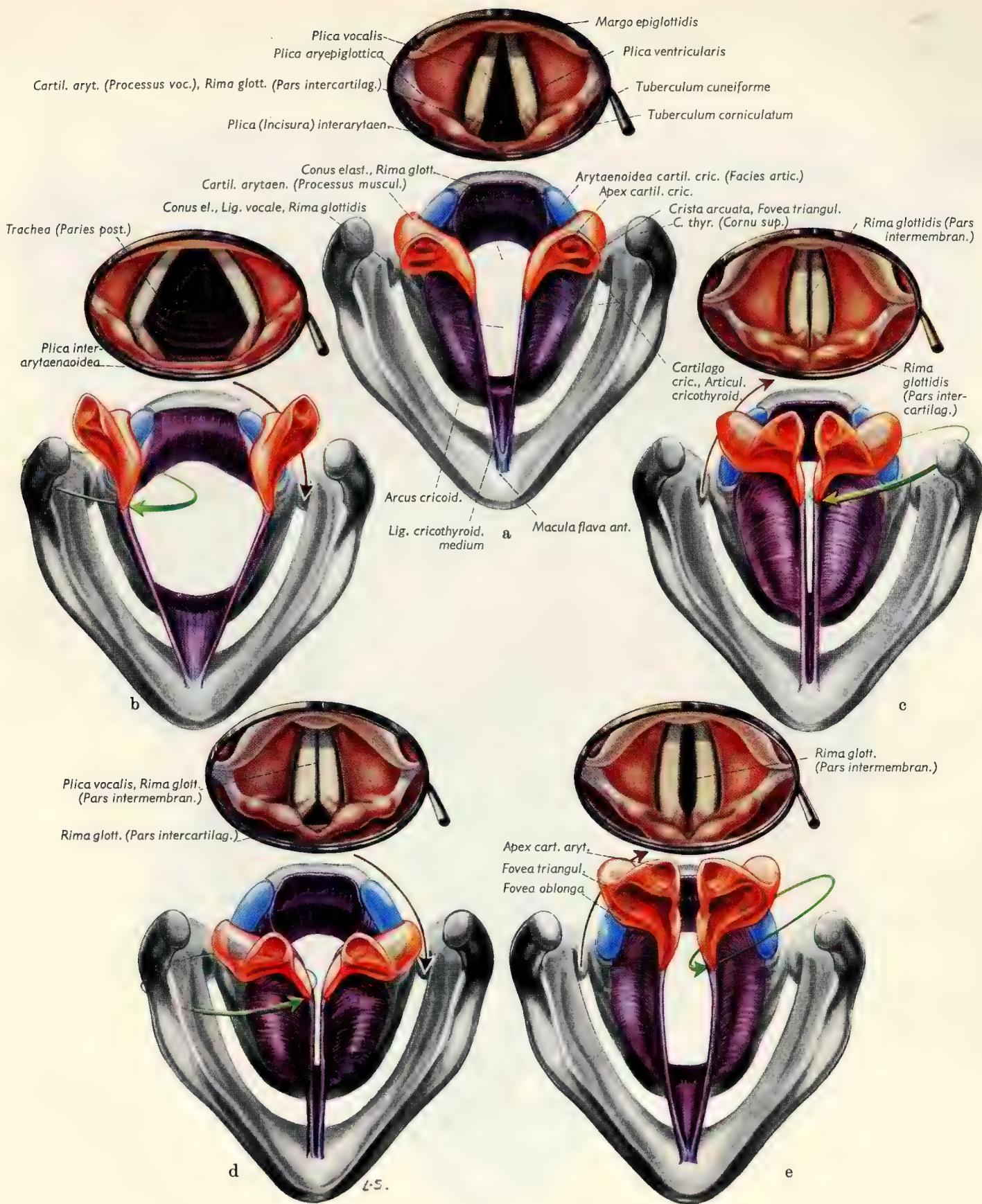


Fig. 332. The shapes of rima glottidis as seen on a skeletal preparation and in the mirror during resting phase (a), respiratory phase (b), and phonation (c); (d) rima glottidis when whispering; (e) rima glottidis in falsetto voice.

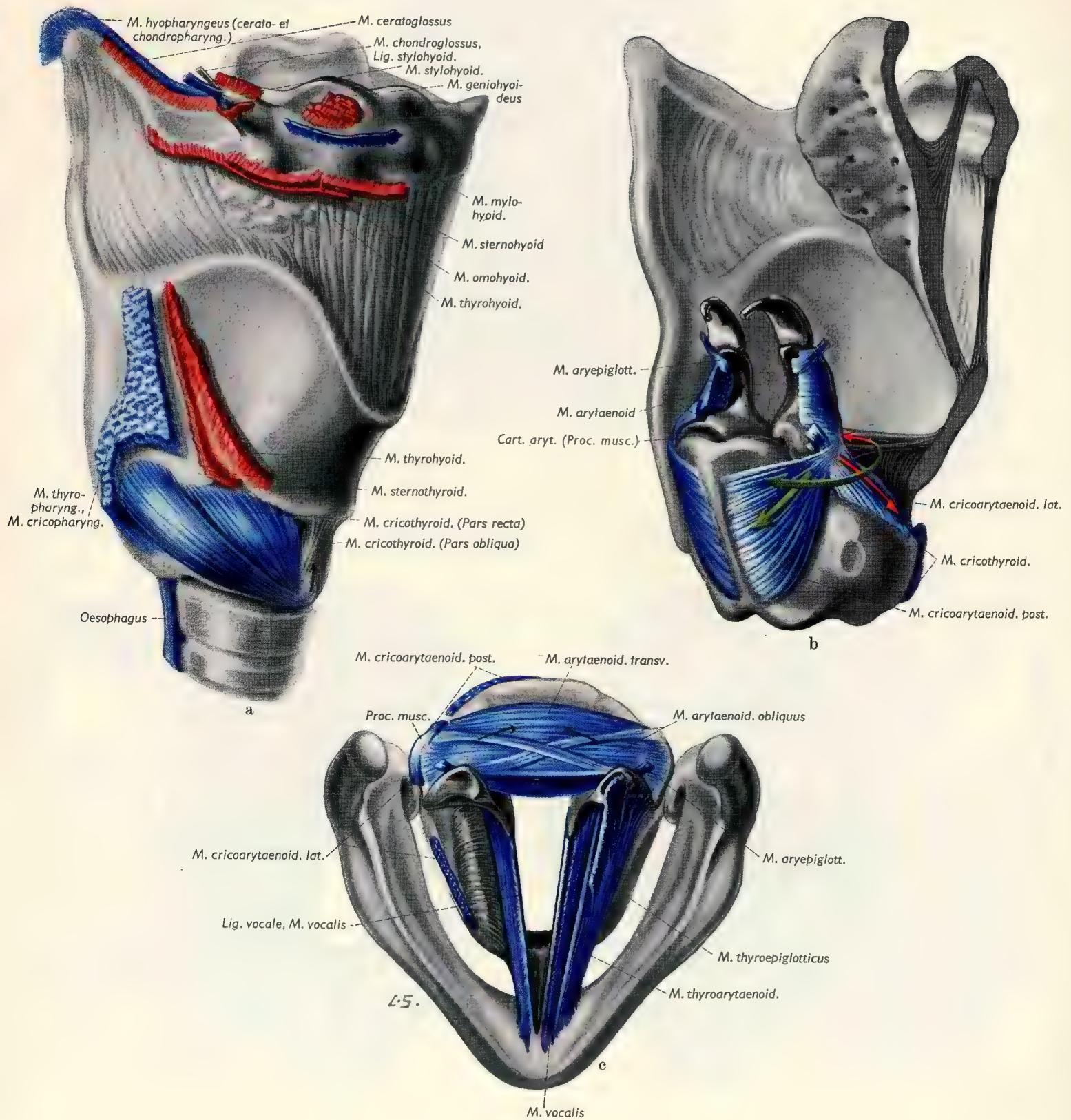
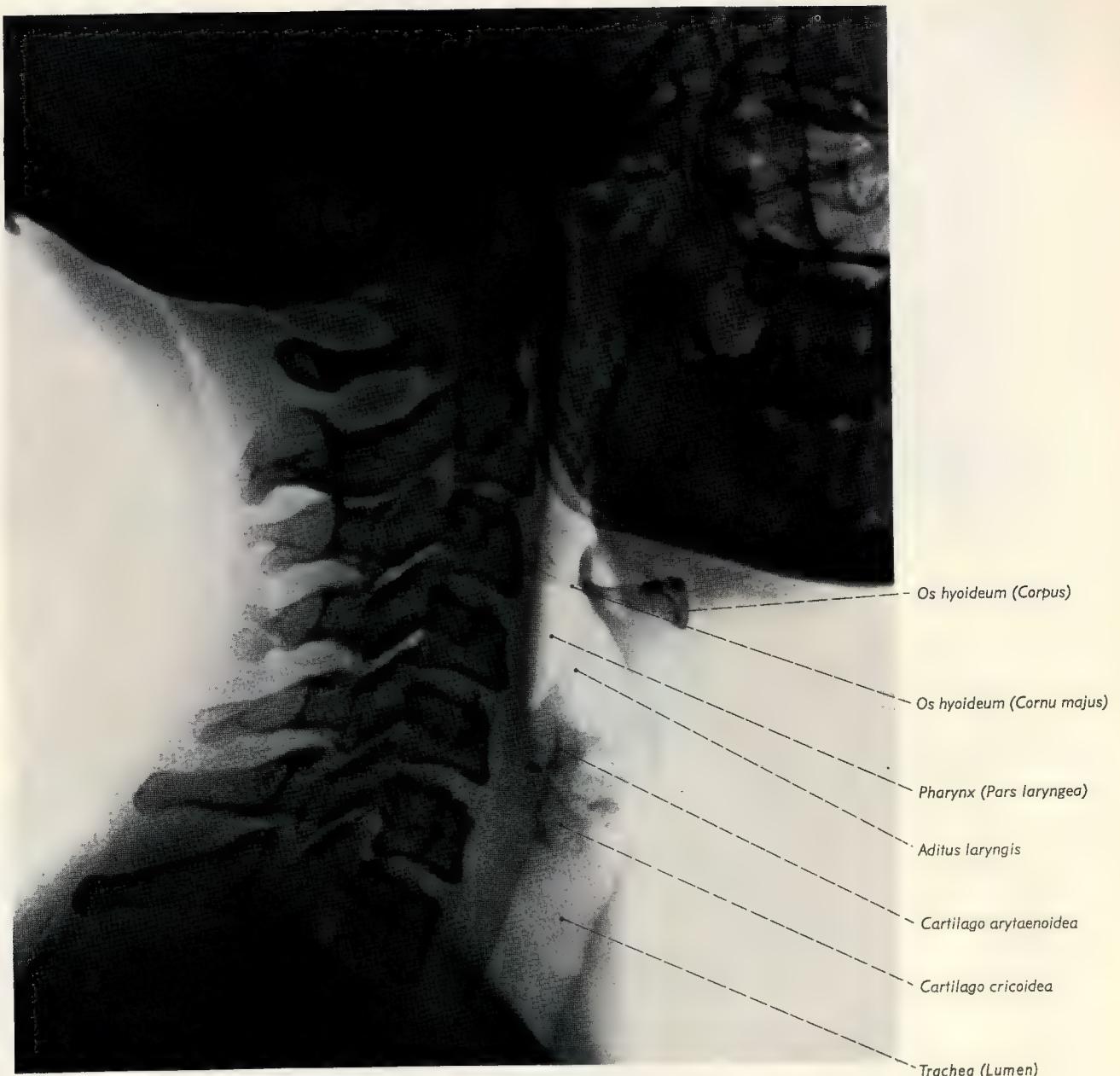
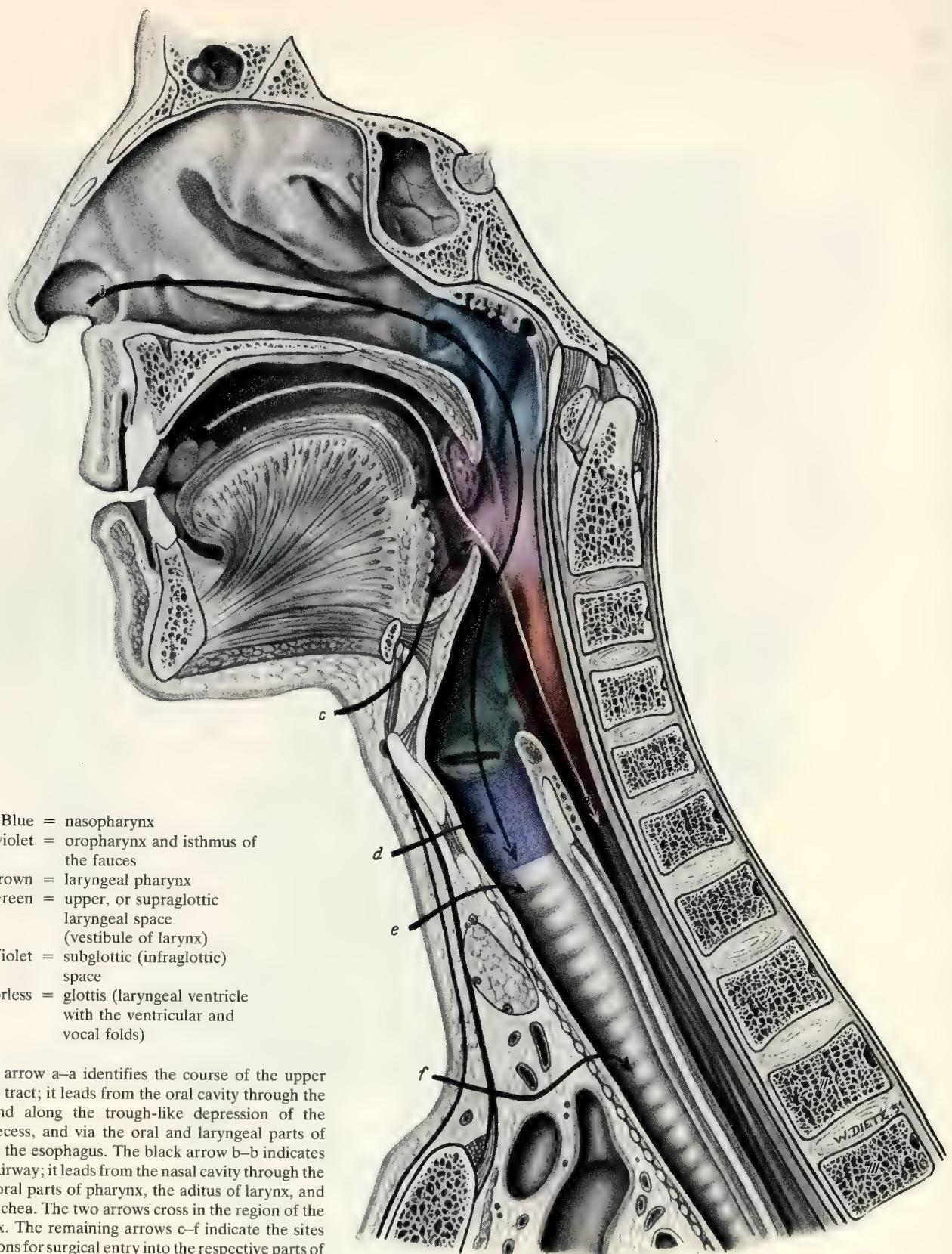


Fig. 333. Muscles of the larynx and their actions when contracting (arrows).



1-7 = cervical vertebrae 1-7

Fig. 334. Lateral roentgenogram of the soft structures in the laryngeal and tracheal regions (from R. Kraus, Heidelberg).



- Blue = nasopharynx
- Light violet = oropharynx and isthmus of the fauces
- Brown = laryngeal pharynx
- Green = upper, or supraglottic laryngeal space (vestibule of larynx)
- Violet = subglottic (infraglottic) space
- Colorless = glottis (laryngeal ventricle with the ventricular and vocal folds)

The white arrow a-a identifies the course of the upper alimentary tract; it leads from the oral cavity through the isthmus and along the trough-like depression of the piriform recess, and via the oral and laryngeal parts of larynx into the esophagus. The black arrow b-b indicates the upper airway; it leads from the nasal cavity through the nasal and oral parts of pharynx, the aditus of larynx, and into the trachea. The two arrows cross in the region of the oropharynx. The remaining arrows c-f indicate the sites and directions for surgical entry into the respective parts of the digestive and respiratory tubes from the front: Arrow c indicates the approach in a subhyoid pharyngotomy in which the thyrohyoid membrane is incised immediately under the hyoid bone to gain entrance into the oropharynx; in this way the larynx can also be inspected from above. Arrow d indicates the approach in the so-called coniotomy in which the cricothyroid lig. is cut transversely and the subglottic laryngeal space is opened. Arrow e identifies the site for a high tracheotomy; and arrow f, the approach in a low tracheotomy under the isthmus of the thyroid gland.

Fig. 335. The various levels of the larynx and pharynx in midsagittal section (view of the right half of the specimen).

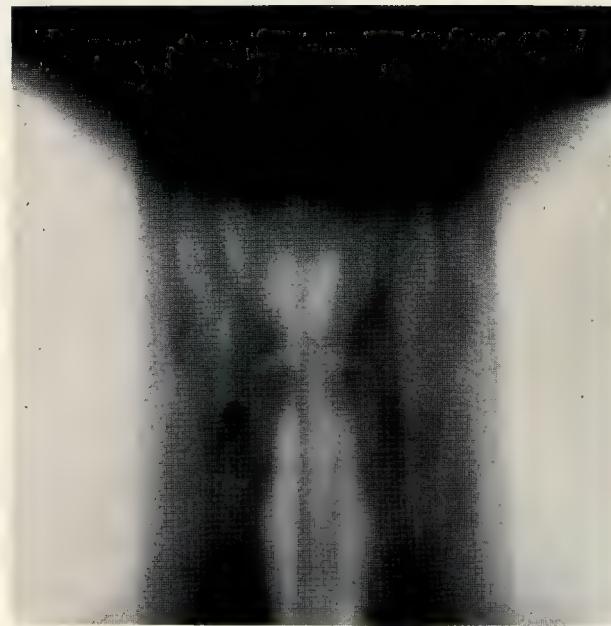
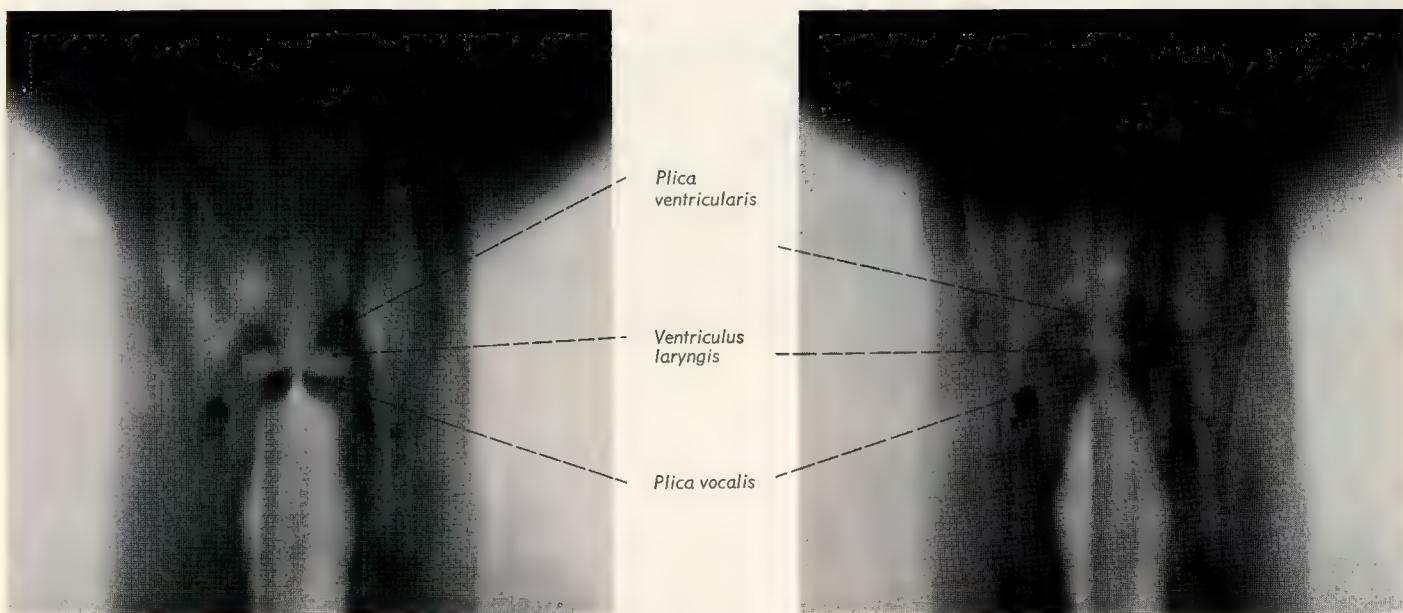
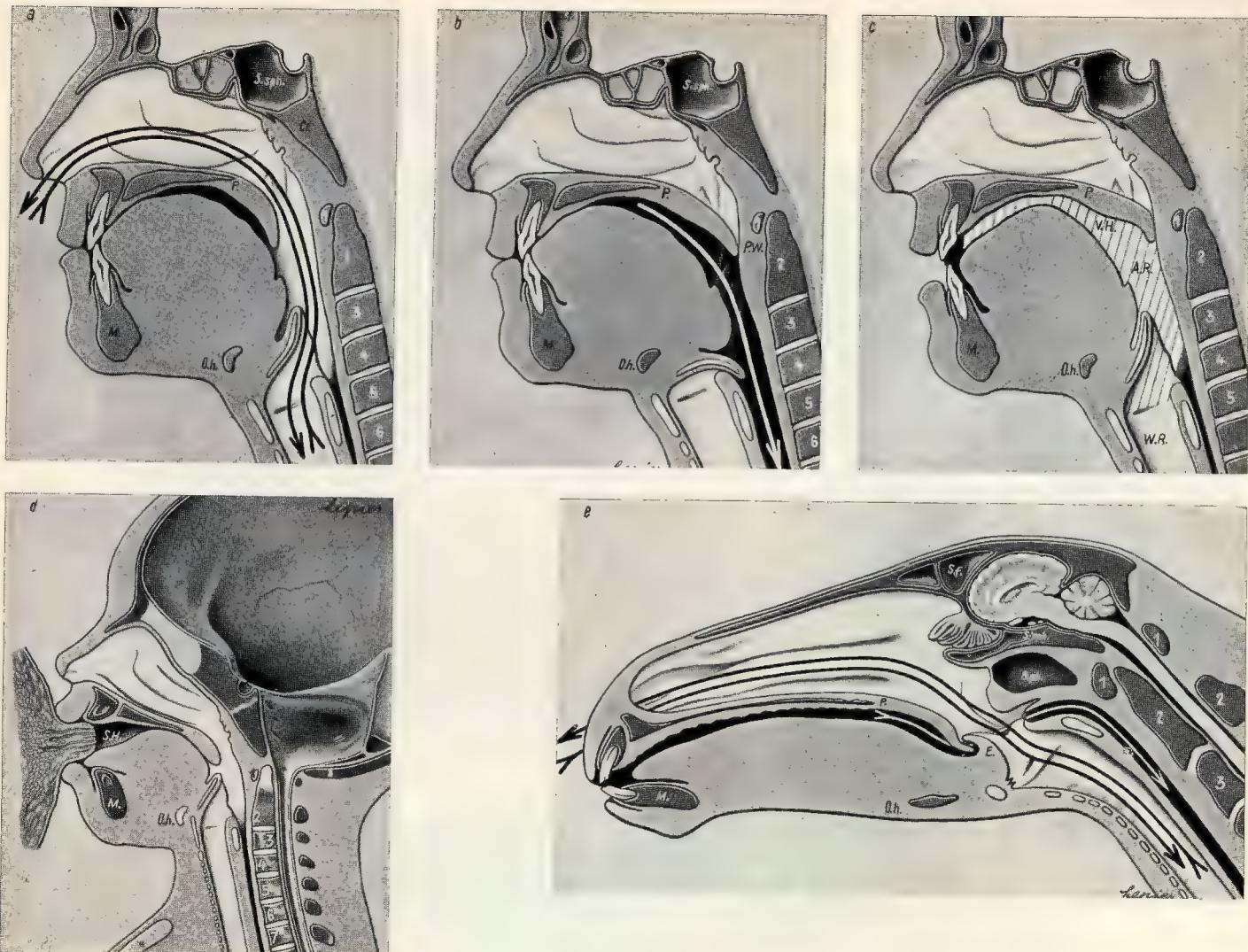


Fig. 336. (Top, left) Tomogram of larynx (A-P) during pronunciation of the vowel "u" (depth of field 16 cm) (from R. Kraus, Heidelberg).

Fig. 337. (Top, right) Tomogram of larynx during normal respiration (from R. Kraus, Heidelberg).

Fig. 338. (Bottom) Tomogram of larynx during deep inspiration (from Prof. Dr. R. Kraus, Heidelberg).



a) During quiet respiration the airway (white) appears wide open toward pharynx; the upper and lower parts of the airway indicate the direction of the air flow during inspiration and expiration.)

b) During the act of swallowing the upper and lower airways are closed off from the oropharynx by the soft palate (Passavant's cushion) and the epiglottis, respectively; only the digestive tract (black) is open; the white arrow indicates the direction in which the bolus moves toward the esophagus.

c) The process of phonation while pronouncing a vowel. The airway is white and the channel used is cross-hatched. Although the upper airway can be sealed off by the soft palate, it must not be totally isolated; the nasal passages may serve an important function by adding a nasal quality to the sound of a vowel. (The soft palate is elevated the least when the vowel "a" is expressed.)

d) The act of sucking (median section of the head and neck of a newborn). The oral cavity as a suction pump (indicated in black) is closed off from the pharynx by means of the soft palate and the root of the tongue; the airway is open so that breathing may take place during the act.

e) The intranasal larynx (median section through the head and neck of a mammal, the horse). The airway (white, black arrows) as well as the passage of food (black, white arrows) which is split in the pharynx by the epiglottis, appear open and passable. The 2 pathways (arrows) cross in the oropharynx where the white arrow lies to the side of the epiglottis in the channel provided by the isthmus of the fauces and the piriform recess.

A.R. = oropharynx
 B.ph = pharyngeal bursa
 Cl = clivus
 E = epiglottis
 M = mandible

O.h. = hyoid bone
 P = soft palate
 P.W. = Passavant's cushion
 S.f. = frontal sinus
 S.sph. = sphenoid sinus

S.H. = suction cavity
 V.H. = vocal cavity
 W.R. = windpipe
 1-7 = cervical vertebrae 1-7

Fig. 339. The craniocervical digestive and respiratory tracts in midsagittal section.

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